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Phyto-Edaphic Communities of the Upper Rio Puerco Watershed, New Mexico

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Abstract

The Upper Rio Puerco Watershed in northwestern New Mexico was classified into 45 ecological phyto-edaphic communities using cluster analysis based on species importance values. The community descriptions consist of vegetation and soil surface characteristics; landform; soil series, association, or complex; ecological stage; and potential natural vegetation. The communities represented 11 vegetation series consisting of 2 treeland, 5 shrubland, and 4 grassland formations. Three soil orders, 27 soil series, nine associations, and three soil complexes were identified. The combination of landform, vegetation, and soil were considered phyto-edaphic communities. A dichotomous key was developed for field identification.

Acknowledgments

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MANAGEMENT IMPLICATIONS

The phyto-edaphic communities classified on an ecological basis allow for extrapolation of research results to similar environments and provide a base for management prescriptions and interpretation of ecological succession.

The Rio Puerco watershed is a semi-arid basin in northwestern New Mexico. The watershed has a long history of settlement, heavy livestock grazing, and site degradation which began in the mid- to late 1700s (Calkins 1937, Dortignac 1960, Vincent 1984). Research was needed to develop, evaluate, and monitor improved management of the vegetation, livestock, and wildlife resource of the watershed while improving soil stability and water quality[2].

This study was designed to define, describe, and quantify ecological phyto-edaphic communities on the Rio Puerco watershed. The phyto-edaphic communities will be used as a compatible ecological basis (Francis 1978) to develop and evaluate management schemes, including changes in vegetation, soil surface factors, ecological state, and soil stability. Also, ecological classification was needed to provide criteria for extrapolating quantitative research results and potential subsequent management prescriptions to broader and similar semi-arid environments (Aldon and Garcia 1971), and as a basis for interpreting ecological succession (Huschle and Hironaka 1980, Stewart and Hann 1983).

PLANT COMMUNITY CLASSIFICATION

Classification of natural communities has been extensively discussed and has had a crucial role in the evolution of ecological theory. Whittaker (1962) reviewed the theory, the meaning, and the problems of natural community classification. Trends in vegetation classification were reviewed by Shimwell (1972), including the polyclimax concept (Tansley 1920) and the monoclimax concept (Clements 1916).

Plant communities are complex phenomena in which there is no single, natural unit of classification (Whittaker 1978). Different systems of classification have been adapted to different kinds of landscapes, vegetation, and interests (Bailey et al. 1978, Daubenmire 1984). Meeker and Merkel (1984) reviewed five climax theories and made a recommendation for vegetation classification. An ideal classification system must be based on readily identifiable elements applicable to all land area for which the concept of potential natural vegetation was proposed rather than the concept of climax; a theoretical past condition (Mueller-Dombois and Ellenberg 1974, Schlatter 1983, Driscoll et al. 1984). Potential natural vegetation allows for the present existing vegetation and site to be projected into the future (Tuxen 1956).

Classification is a basis of comparison with the environment affecting the composition of vegetation, and involves arranging stands into classes which have common characteristics (Greig-Smith 1983). Whether vegetation is perceived as continuous or discrete, is the basis of two theories known as the community concept and the continuum concept (McIntosh 1967, Langford and Buell 1969). Because of topograhic and/or edaphic factors, it is doubtful that ecologists regard or apply either theory in its pure form.

The choice of characteristics used to classify plant communities influences whether the resultant community-types are natural or artificial entities (Whittaker 1962, 1978). Two principles stated by Gleason (1926) and Ramensky (1926) support the idea that discrete communities are often artificial due to arbitrary boundaries: (1) species are distributed individualistically and, (2) plant communities often intergrade continuously. However, Daubenmire (1966) pointed some concrete discontinua that may occur in any vegetation cover over a gradually changing substrate; and McIntosh (1967) reduced the continuum problem as relating only to the abstract community concept. A concrete, regional vegetation cover may show both discontinua or sharp boundaries and gradual pattern or continua changes (Muller-Dombois and Ellenberg 1974).

SOIL CLASSIFICATION

A system of soil (and/or plant) classification must be dynamic to accept, or even consider new hypotheses and research results. Practical classifications of soils as natural bodies are based on general soil characteristics that can be observed or measured (Simonson 1962), not on external causative factors that are based on inference (Finkl 1982). However, subjective judgments are inevitable in the delineation of classes, because of the ranges of properties within soil populations, and because classifications are based on assumptions that the units are discrete and definable (Finkl 1982). Despite this, the soil units for classifications still are useful for organization and communication (Cruickshank 1972, Finkl 1982).

The principal elements of soil classification have been reviewed (Coffey 1912, Marbut 1922, Muie 1962, Schelling 1970). The evolution of soil classification was divided into five historical periods (Buol et al. 1973). The modern

[2]*USDI Bureau of Land Management. 1977. Final environmental statement: The proposed Rio Puerco livestock grazing management program. 467 p. USDI Bureau of Land Management, Albuquerque, N. Mex. (Mimeo).*

period in the United States emphasized the "7th Approximation" (Soil Survey Staff 1960) and culminated in subsequent revision (Soil Survey Staff 1975).

NEW MEXICO VEGETATION

The southwest desert flora is a derivative of the Madro-Tertiary Geoflora (Axelrod 1979, Lowe and Brown 1982). The most extensive area of grassland west of the Rocky Mountains is the semi-desert type of New Mexico, Arizona, and northern Mexico (Numata 1979). Soils of this area are in the desertic group, low in organic matter and degree of leaching. The ecology and management of southwestern rangelands have been synthesized (Cable 1975, Clary 1975, Martin 1975, Springfield 1976); and the concept, status, and application of southwestern habitat types and other ecological classifications have been presented and compared (Moir and Hendzel 1973).

Potential natural vegetation of New Mexico was mapped by Donart et al. (1978), including five formations, 13 regions, 20 series, and 67 associations. Six ecoregions (Bailey 1976, 1980) and nine biotic communities (Brown and Lowe 1980, Brown 1982) were mapped at small scales and were described; Castetter (1956) previously described the vegetation of New Mexico. Extensive shifts in desert, grassland, and juniper savanna boundaries in portions of New Mexico have been indicated since the 1800s (York and Dick-Peddie 1969); maps were drawn to reconstruct those New Mexico vegetation patterns (Gross and Dick-Peddie 1979). Grassland communities of east-central New Mexico were classified by Beavis et al. (1982); Moir (1979) described soil-vegetation patterns in the Peloncillo Mountains and subalpine tall grass communities of Sierra Blanca (Moir 1967); Baker (1983) classified the alpine vegetation of Wheeler Peak; and the Bureau of Land Management identified seven vegetation sub-types for the Rio Puerco Watershed[2]. Almost all national forests have been classified into habitat types (Moir and Hendzel 1983); but very few specific shrub and grassland communities have been classified in New Mexico.

STUDY AREA

The Rio Puerco Watershed is in New Mexico, west of the Jemez Mountains and northwest of Albuquerque; it includes 1.6 million ha. The Rio Puerco is mostly intermittent or ephemeral, with its headwaters from the western slope of the San Pedro mountains.

The specific study area, referred to as the Upper Rio Puerco Watershed, is 64 km northwest of Albuquerque (fig. 1). It covers about 10% of the total Rio Puerco Watershed. Approximately 207,172 ha are within the study area, of which 159,080 ha are administered by the Bureau of Land Management (BLM)[2]. Elevations within the study area range from 1,662 m to 2,743 m.

The Upper Rio Puerco Watershed is along the southeastern edge of the San Juan Basin, which is within the southeastern part of the Colorado Plateau (Baldridge et al. 1983). It is bounded on the southeast by the Rio Puerco

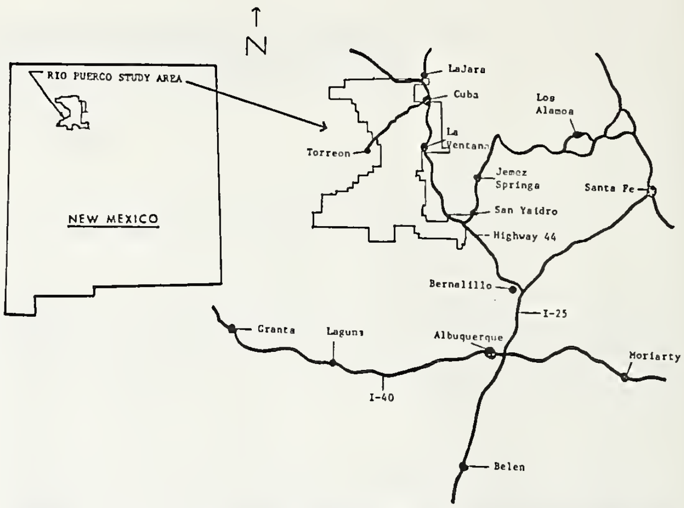

Figure 1.—Upper Rio Puerco Watershed study area, northwest New Mexico.

Fault Zone, and on the east by the Nacimiento Mountains. The east, west, and north are bounded by a continuation of the San Juan Basin. Froehlich et al.[3] described the geologic history.

The climate of the area is semi-arid (Hanson 1962) with an average annual precipitation from four stations during a 20-year period ranging from 215.9 mm to 322.6 mm (fig. 2); the four stations range in elevation from 1,844 m to 2,195 m, respectively[4]. Peak rainfall was during July, August, and September (fig. 3). Summer rains developed as convectional thunderstorms of short duration, high intensity, and uneven distribution. Twenty-year temperature records indicated that maximum summer temperatures approached 38°C and the minimum winter temperature approached −4°C. July was the only month on record without frost; the average frost free growing season ranged from 109 days at higher northern elevations to 170 days at the lower southern elevations.

Soils for a portion of the study area were previously described and delineated by Folks and Stone (1968) and later expanded[5]. Most of the soils were classified as Entisols and Aridisols with minor representation from Mollisols and units mapped as Complexes. The precipitation pattern for the study area followed the Ustic soil moisture regime (Buol et al. 1973) (fig. 3).

The study area included 13 range sites (Folks and Stone 1968), of which soils are a major abiotic determinant (Dyksterhuis 1958). The concept of range condition is related to the concept of range site (Humphrey 1947, Renner 1948). The successional status or ecological stage of a community should include soil-site as an interpretation determinant (Reppert and Francis 1973). Shiflet

[3] *Froehlich, J. S., B. S. Kues, S. G. Lucas, and R. K. Olmo. 1975. Paleontological resource assessment of 500,000 acres in the Rio Puerco grazing environmental impact study area. University of New Mexico, Albuquerque. (Mimeo).*

[4] *National Oceanic and Atmospheric Administration (NOAA). 1984. Climatological data: New Mexico—special summary. 25 p. U.S. Department of Commerce, NOAA, National Climatic Data Center, Asheville, N. C.*

[5] *USDA Soil Conservation Service. 1977. Soil survey of BLM lands: Sandoval and McKinley Counties. USDA Soil Conservation Service, preliminary report. Albuquerque, N. Mex. (Mimeo).*

(1973) reviewed the range site concept, history, status, and application.

Donart et al. (1978) listed 4 potential natural vegetation formations, 4 regions, and 10 plant associations for the general study area. The BLM designated nine vegetation sub-types[2] within the study area which offer general classification information.

The most common naturally occurring soil problems include wind and water erosion associated with sandstone and shale parent materials, low available soil moisture, and soil textures with high sand or clay content[2]. Clayey textured soils in the study area have high shrink-swell potentials, slow infiltration rates, and reduced available soil moisture for plant growth. Sandy soils have excessive drainage, making them subject to wind erosion when dry. Sediment yields varied depending on the area[6], vegetation, soil, measurement period, and measurement procedure (Burkham 1960, Aldon and Garcia 1973).

METHODS

DATA COLLECTION

To maintain compatibility with recommended classification elements (Brown et al. 1979, Driscoll et al. 1984), landform, soils, and vegetation were used to identify phyto-edaphic sites for sampling and as a basis for classification. Hickey and Garcia (1964) identified uplands, breaks, and alluvial landform classes on a semiarid rangeland. Based on their findings, the following five expanded landform classes were used.

[6]*USDI Soil Conservation Service. 1974. Upper Rio Grande Basin — water and related land resources, New Mexico. Regional Technical Center, Portland, Oreg. (Mimeo).*

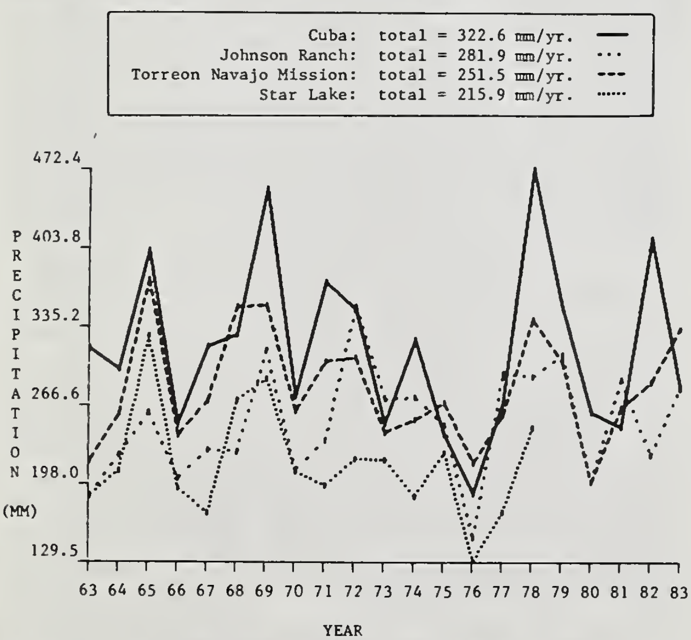

Figure 2.—Yearly total precipitation for the Upper Rio Puerco Watershed, 4 sites, 1963-1983. Mean total precipitation for each site is shown in the key.

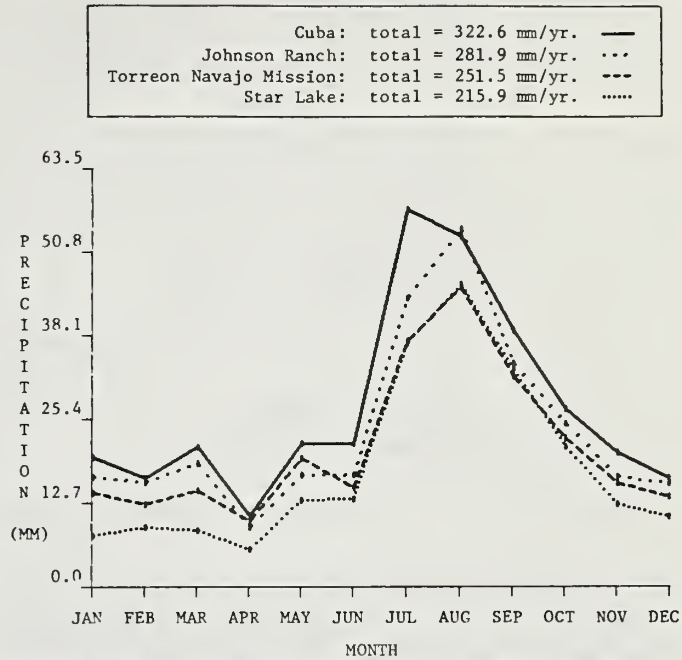

Figure 3.—Mean monthly precipitation for the Upper Rio Puerco Watershed, 4 sites, 1963-1983. Mean total precipitation for each site is shown in the key.

1. Mesas and ridge tops (uplands): Soils were residual; slopes were less than 2%.
2. Colluvial slopes: Areas usually of 10% slope or greater from which active or intermittent soil movement occurs, usually in nonaccelerated status; usually middle or upper slopes.
3. Lower colluvial slopes: Areas usually of 2–10% slope, where soil material (colluvium) from upper colluvial slopes is deposited above alluvial flats. Finer soil in suspension may pass through to alluvial flats or drainageways.
4. Alluvial flats: Areas of 0–2% slopes, where fine textured alluvium produced a characteristic landform with distinct topographic, soil, and vegetative boundaries.
5. Breaks: Rough, broken country with unstable soils, or areas where topography was too steep for normal soil development. Critical slope angle was undefined and varied with soil texture.

Soils data for the study area were compiled from the soil surveys of the Cabezon Area, New Mexico (Folks and Stone 1968) and the soil survey of Sandoval County, New Mexico[5].

A preliminary reconnaissance of the study area indicated that 6 biomes and 13 vegetation series were present (Brown et al. 1979) (table 1). These biomes and their associated series were used as one of the classification element variables and the first level of stratification for sampling the study area.

The sampling procedure and site selection were based on homogeneous vegetation stands from which data were collected to quantify, identify, and classify the sites. The selection of stands was not based on lack of disturbance. The intent was to describe the existing vegetation of the study area so that present ecological stage and potential natural vegetation could be determined, and

Table 1.—Biome and series level vegetation classification for the Upper Rio Puerco Watershed. (Brown et al. 1979).

Biome	Series
Rocky Mountain Montane Conifer Forest	Pinus (*Pinus* spp.)
Great Basin Conifer Woodland	Pinyon-Juniper (*Pinus edulis-Juniperus monosperma)*
Plains Grassland	Grama (*Bouteloua* spp.)
Great Basin Shrub-Grassland	Ricegrass (*Oryzopsis* spp.)
	Sacaton (*Sporobolus* spp.)
	Galleta (*Hilaria* spp.)
Semi-Desert Grassland	Grama-Scrub (*Bouteloua* spp.-scrub)
Great Basin Desert-Scrub	Sagebrush (*Artemisia* spp.)
	Rabbitbrush (*Chrysothamnus* spp.)
	Winterfat (*Eurotia* spp.)
	Saltbush (*Atriplex* spp.)
	Greasewood (*Sarcobatus* spp.)
	Mixed Shrub (*Frankenia* spp.)

to facilitate quantification and description of the existing vegetation communities for trend monitoring, application of management prescriptions, and ecological stage identification.

SITE MEASUREMENTS

The selection of sample sites was objective in order to minimize ecotones and site confounding, and to maximize homogeneity. A total of 114 sample sites were selected (fig. 4) where apparent changes in floristic aspect or plant composition, landform, and/or soils suggested a possible change in ecological sites. Transects were randomly established within each sample site. The number of transects per site varied from two to five, depending upon the apparent diversity and size of the site.

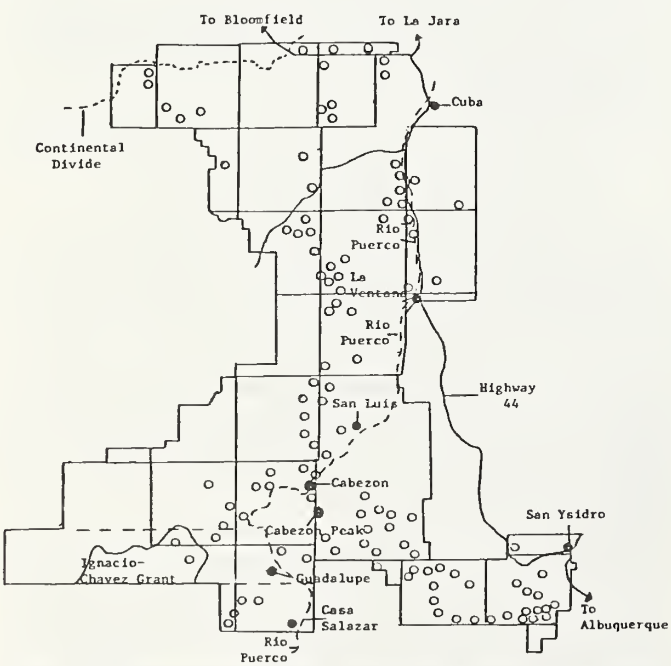

Figure 4.—Sample site locations (o) within the Upper Rio Puerco Watershed.

The Community Structure Analysis (CSA) technique (Pase 1981) was used to determine plant species foliar cover, density, and frequency defined respectively as the area of the ground surface covered by above-ground plant parts projected to the ground surface, the number of plants per unit area, and the number of plots in which a species occurred expressed as percentage of the total (Greig-Smith 1983). Transects consisted of one hundred 5 cm by 10 cm microplots (Morris 1973) for foliar cover, and ten 0.5 m^2 circular plots for density and frequency. The microplots were systematically located every 2 m on a pace interval, and the circular plots were located at each tenth microplot. For each microplot, plant foliar cover by species was estimated using the following classes: t(trace) = 0–5%, 1 = 6–15%, 2 = 16–25%, 3 = 26–35%, 4 = 36–45%, 5 = 46–55%, 6 = 56–65%, 7 = 66–75%, 8 = 76–85%, 9 = 86–95%, and 10 = 96–100%; analysis was based on class mid-points. In addition, plant litter, bare soil, and rock fragments larger than 1-inch diameter were estimated according to the same cover classes. Litter was defined as loose plant debris, or standing dead material for grass not of the current year's growth. Synusae (life-form strata) were evaluated separately. Frequency for each species was calculated using data from the 0.5 m^2 plots; possible frequency ranged from 0–100% in 10% increments. Voucher specimens were collected and verified;[7] not all fragmented plants could be identified.

[7]Voucher specimens were verified by Dr. Charles Feddema (USDA Forest Service Herbarium, Rocky Mountain Station, Fort Collins, Colo.) or Reggie Fletcher (Regional Botanist, USDA Forest Service, Southwestern Region, Albuquerque, N. Mex.).

DATA ANALYSIS

Site data were analyzed and summarized using program COSAM[8], which provided a summary of plant species with associated cover, density, and frequency values; the percent cover of bare soil, litter, rock; a ranked and arrayed importance value (IV) for each species; and a diversity index (DI).

Cover (C), density (D), and frequency (F) were considered to be three significant structural components of a community, and were used to calculate an importance value (Phillips 1959, Dix 1961) for each species by transect and site. These three variables represent an estimate of area, number, and distribution, respectively. Use of a single variable to describe community structure could result in over or underestimating an individual species contribution to the community (Dix 1961, Daubenmire 1968). This is especially true when dealing with a large number of species with widely contrasting structural characteristics and biological requirements. Therefore, an importance value for each species in each site was calculated to evaluate its contribution to and "importance" in the community. An importance value implies a species relative structural dominance and competitive status within a community, not the species value as forage or other use connotation. The value was based on equal weight of the relative foliar cover (percent), relative density (plants per 0.5 m^2), and relative frequency (presence/absence of a species within a sample site). There is some question about the validity of giving these three plant community structural components equal value (Daubenmire 1968), and using relative rather than absolute values (Mueller-Dombois and Ellenberg 1974). Preliminary studies (Pase 1981) suggested three advantages of the present procedure: (1) IV was based on relative rather than absolute values; therefore, it was less affected by estimator bias; (2) the relative position of a plant in the community array was less disturbed by year-to-year differences in precipitation, because climatic variations affected all species to some magnitude; and (3) displacement of an IV within an array resulted from some differential ecological pressure against a species, such as differential grazing pressure or insect and/or disease perturbation, and is an unbiased estimator of changes in the plant community, or range condition (ecological stage).

The importance values were calculated using:

$$IV_i = \frac{C_i}{\Sigma C} + \frac{D_i}{\Sigma D} + \frac{F_i}{\Sigma F} \qquad [1]$$

where: IV_i = importance value of the i^{th} species;
C_i, D_i, F_i = mean cover, density, frequency of the i^{th} species; and
ΣC, ΣD, ΣF = the total cover, density, frequency for all sample species.

Importance values were summarized and averaged by species and by site.

[8]Program COSAM (Community Sample) was developed by and is on file at the USDA Forest Service, Rocky Mountain Station, Fort Collins, Colo.

The diversity indices (DI) of the sites were calculated based upon absolute density using the formula of MacArthur and MacArthur (1961):

$$DI = -\sum_{i=1}^{s} P_i \log_e P_i \qquad [2]$$

where: P_i = density of species i as a proportion of total density for a site, and
s = total number of species in the site, or species richness (SR).

This index is essentially the same as the Shannon-Weiner index:

$$H^1 = -\sum_{i=1}^{s} P_i \log P_i \text{ (Pielou 1975);} \qquad [3]$$

both are referred to as information theory indices (Peet 1974).

The mean importance values for each site from program COSAM[8] were used to calculate resemblance coefficients and to develop resemblance matrices. The resemblance matrix consisted of dissimilarity coefficients derived from Euclidean distance coefficients (Sneath and Sokal 1973, Romesburg 1984). Euclidean distance coefficients were calculated using:

$$e_{jk} = \left[\sum_{i=1}^{n} (x_{ij} - x_{ik})^2\right]^{1/2} \qquad [4]$$

where
e_{jk} = Euclidean distance between site j and site k;
x_{ij} = variable value for species i in site j;
x_{ik} = variable value for species i in site k; and
n = number of species.

The dissimilarity coefficient, e_{jk}, can be no smaller than 0.0, the value when sites j and k are maximally similar (identical). The larger the e_{jk} value, the more dissimilar are the sites.

A dendrogram was produced using the resemblance matrix and a clustering method from program CLUSTAN (Cluster Analysis) (Wishart 1981). The clustering method used was developed by Ward (1963) and is based on the minimum variance between two sites (Romesburg 1984). The cluster routine followed a hierarchical-agglomerative-polythetic approach (Goodall 1978, Romesburg 1984). The dendrogram was developed using the vegetation variables of non-standardized IV data. To develop meaningful and realistic clusters, an IV $\geq$ 0.1 was used which appeared to include species which dominated the sites.

Resultant dendrograms were evaluated for realistic clusters using successive approximation (Poore 1962) and original site data summaries. Clusters were evaluated as to their separation of lifeform (tree, shrub, grass) and grouping of dominant species by site. Inter-cluster versus intra-cluster variability based on Euclidean distance was compared (Dyer 1978) as an index to significant clusters.

RESULTS AND DISCUSSION

LANDFORM

The 114 sites sampled and classified were on five landform classes (table 2). Most grassland and shrubland sites were on alluvial flats, while the treeland sites generally were on mesas and colluvial slopes at higher elevations.

SOILS

Three soil orders, 27 soil series, 9 associations, and 3 complexes were identified within the study area (table 3). The three mapped units classified as complexes were identified to the suborder level, and one unit was identified as an azonal alluvial unit. Modal profile diagrams are in Appendix A.

Entisols

Fifteen soil series mapped singly and/or mapped into four soil associations were in the Entisol soil order. The Travessilla, Shingle, and Persayo soil series were mapped into two associations with depths of the A- and C-horizons of less than 50 cm and textures in the sandy-loam to silty-clay loam class (Appendix A). Of the remaining 12 series within the Entisol order, 7 were mapped singly; 5 series were mapped into 3 associations (Appendix A). These 12 series had depths of at least 152 cm, contained an A1- and several C-horizons; surface textures ranged from silty-clay-loam, loamy-sand, clay-loam, and clay.

Most of the series within the Entisol order had a pH range of 8.0 to 8.8, were mesic, calcareous, ustic, hot-dry (Torri), and had a mixed minerology. Three of the series were unnamed.

Several factors seem to limit soil development. These factors are mass soil movement and other erosion forms which remove surficial material from the sites as fast as or faster than most pedogenic horizons can form (Buol et al. 1973). Solifluction or creep also may be operating on slopes as low as 2%. Most of the Entisols were on alluvial floodplains and probably were subject to cumulization, which may add new surface material as fast or faster than it can be assimilated into a pedogenic horizon. Lack of vegetation favors erosion and downslope deposition. A number of the series have been formed in sandstone and shale parent materials influenced by inert siliceous sediments inhibiting profile differentiation. Low fertility for plant growth of some initial materials limits biogenetic differentiation of the soil profile. Campbell (1968) confirmed low inherent soil fertility and sparse organic matter content. Lack of time may be another factor limiting soil formation and profile development. Given the total effective environment of the study area and region, these soils may be in equilibrium with their environment and associated vegetation, and may represent the edaphic "climax" of the region (Whittaker et al. 1968).

Aridisols

The Aridisol soil order was represented by 10 mapped series, all but one of which was mapped into 5 associations (table 3). One of the associations (A4) was mixed between Aridisol and Entisol (Appendix A); two of the series were unnamed. Most of the series were fine-loamy texture, mixed mineralogy, mesic, ustollic, and calcareous.

Table 2.— Distribution (*) of vegetation formation and series by landform class and related number of soil series and sample sites for the Upper Rio Puerco Watershed.

Plant community classification	Landform Class: Mesa	Colluvial[1]	Alluvial	Breaks	Number of soil series	Number of sites
Treeland						
Pipo-Pied	*	*			6	7
Jumo	*	*		*	8	9
Shrubland						
Artr	*	*	*		19	24
CHRY			*		5	5
Save			*		3	3
Cela	*	*	*		9	10
Atcu		*			1	1
Atob					3	4
Arno		*	*	*	2	2
Atca			*		6	7
Grassland						
Bogr	*	*	*		9	12
Hija		*	*		11	12
Spai	*		*		13	14
Boer	*				2	2
Spne	*				1	1
Scbr			*		1	1

[1]*The two colluvial slope classes (≥10%, and < 10%) have been combined in this column.*

Table 3.— Soil classification and associated plant communities in the Entisol, Aridisol, and Mollisol soil orders and Complexes for the Upper Rio Puerco Watershed.

Subgroup	Family	Series	Association	Plant Community #
		Entisols		
Ustic Torriorthent	loamy, mixed, calcareous, mesic	Shingle	A1	1,2,6,21,22,23,26,41
Lithic Torriorthent	loamy, mixed, calcareous, mesic	Travessilla	A2	14,22,32,34,35
Typic Torriorthent	loamy, mixed, calcareous, mesic, shallow	Persayo		
Ustic Torriorthent	fine, mixed, calcareous, mesic	Galisteo		
Ustic Torriorthent	fine, mixed, calcareous, mesic	Unnamed 2	A3	13, 27
Ustic Torriorthent	fine-loamy, mixed, calcareous, mesic	Unnamed 2B		
Ustic Torripsament	mixed mesic	Sheppard Variant	A9	7,28,30,36,39
Ustic Torrifluvent	fine, mixed, calcareous, mesic	Unnamed 13		
Typic Torripsament	sandy, mixed, nonacid, mesic	Berent		9,17
Typic Torrifluvent	fine-silty, mixed, calcareous, mesic	Billings		21,29,31,32,35,38,39
Typic Torrifluvent	fine, mixed, calcareous, mesic	Christainburg		11,13,15,19,20,24,29, 36,39,40,42
Typic Torrifluvent	coarse-loamy, mixed, calcareous, mesic	Fruitland		11,13,17,39,40
Typic Torrifluvent	fine-silty, mixed, calcareous, mesic	Ravola		18,39
Ustic Torriorthent	fine-loamy, mixed, calcareous, mesic	Kim		29,36,43,45
Typic Torriorthent	fine, mixed, calcareous, mesic	Navajo		19
		Aridisols		
Ustollic Camborthid	fine-loamy, mixed, mesic	Atrac	A5	10,12
Ustollic Camborthid	fine-loamy, mixed, mesic	Unnamed 4		
Ustollic Camborthid	fine-silty, mixed, mesic	Las Lucas	A6	9,16,21,22
Ustollic Camborthid	fine-loamy, mixed, mesic	Unnamed 7B		25,32,35,36,37,40
Ustollic Haplargid	fine-loamy, mixed, mesic	Hagerman	A7	31
Mollic Haplargid	fine-loamy, mixed, mesic	Penistaja	A8	3,8,9,13,32,35
Lithic, Ustollic Haplargid	loamy, mixed, mesic	Bond		
Mollic Camborthid	fine, mixed, mesic	Little		36
Ustollic Haplargid	fine-loamy, mixed, mesic	Poleo	A4	9,10,11,12,13
Ustic Torriorthent	fine, mixed, calcareous, mesic	Unnamed 2 (Entisol)		
		Mollisols		
Lithic Arguistoll	clayey, montmorillonitic, mesic	Cabezon		1,7,35
Entic Halustoll	fine-loamy, mixed, mesic	Prewitt		10
		Complexes		
Basalt Outcrops-Orthents-Ustolls			C1	4,6,7,32,33,43
Rock Outcrops Orthents			C2	6,41
Rock Outcrops-Gypsum			C3	5,21,39,44
Alluvial				17,24,29,40

The Bond and Unnamed–04 series were the most shallow, with less than 38 cm of effective soil. All other Aridisols were between 76 and 152 cm deep, with most greater than 102 cm (Appendix A). All series had an A1-horizon; series in association A5 had an A2-horizon; and all but Poleo and Bond had a B3ca-horizon. All but the Atrac series had an A1-horizon pH of 8.2; and all but the Hagerman series had one or more C-horizons.

Aridisols are associated with semi-arid climates and vegetation, and commonly have Entisols as inclusions (Buol et al. 1973). Also, the areas of Aridisol development are associated with Mollisols in surrounding cooler and/or wetter areas. This pattern fit the study area; most of the soils were Entisols with Aridisol associates and Mollisols at higher elevation sites which were cooler and more moist.

Leaching evidence often is seen in Aridisols; but this may be a result of rainfall extremes rather than means. The Aridisol environment is characterized by sparse plant growth, low surface soil organic matter, and low carbon/nitrogen ratios (Soil Survey Staff 1975). The soils inherit much of their morphology from the parent material and the lack of leaching has left the profiles with a high base status (Buol et al. 1973). Profiles are well oxidized; and profiles on the older, more stable landforms have accumulated clay to form argillic horizons as have three of the study area series with B2t-horizons (Appendix A). Five of the series were Camborthids, and the other four were Haplargids (table 3).

Mollisols

Two of the 27 soils series were in the Mollisol soil order (table 3). The Prewitt series supported only one plant community, and was classified as a fine-loamy, mixed, mesic, entic Haplustoll. The soil depth exceeded 127 cm and had an A1-horizon pH of 8.0; all horizons were loamy (Appendix A).

The second Mollisol series, Cabezon, was shallow with an effective soil depth of less than 50 cm (Appendix A). The A1-surface horizon and B2t-horizon both had pH values of 7.0. The Cabezon series supported three plant communities and was classified as a clayey, montmorillonitic, mesic, lithic Argiustoll (table 3).

The two Mollisols in the study area were relatively young, because the clay content in the A-horizon was nearly equal to the clay content of the lower horizons, especially the B2t-horizon. The Prewitt series had no B-horizon. Eluviation, illuviation, and percolation are probably acting minimally on these soils because of the overall low precipitation of the study area and region.

Complexes

Three relatively shallow complexes were identified and mapped in the study area (table 3). Two of the complexes were classified to the suborder level: Orthents and Ustolls, both associated with rock outcrops. Maximum depth of the soils in the complexes was about 50 cm (Appendix A). The general texture of soils found in complex 1 and 2 was silty-clay-loam. The third complex was a combination of rock outcrops and gypsum. The three complexes supported 10 different plant communities from each of the three vegetation formations.

Alluvial

An azonal, stratified mapping unit that was identified and classified as Alluvial land was deep, light colored, and nearly level or gently sloping (Folks and Stone 1968). It occurred on alluvial fans and flood plains throughout the study area. The surface layer was about 25 cm thick, very pale brown, contained free lime, and had a granular structure with texture ranging from loamy-fine-sand to loam (Appendix A). The subsoil was structureless and more compact than the surface layer. The subsoils consisted of stratified loam, sandy-loam, and clay loam derived from alkaline shale and sandstone deposited by streams. Alluvial land is well drained, permeability is moderate to slow, organic matter is low, and gully erosion is high. Alluvial land supported four plant communities; no community was unique to the map unit (table 3).

Results indicated that most plant communities occurred on more than one soil mapping unit and that most soil mapping units supported more than one plant community. There was no apparent qualitative correlation between plant communities and soil map units on the study area; no quantitative correlation was attempted.

VEGETATION

It was hypothesized that using species IV and Ward's clustering method would produce a dendrogram representing distinct site clusters of realistic plant communities and that an IV $\geqq$ 0.1 would yield precise clusters using fewer species and, therefore, not confounding the E values used in Ward's method. By limiting the IV's to $\geqq$ 0.1, it was speculated that only the most dominant species and lifeforms within each site would determine the fusion points.

The advantage of cluster analysis makes classification possible, even if it is arbitrary (Barbour et al. 1980). Although cluster analysis may be subjective, it quantifies the classification process because some threshold value may be chosen as the lower limit to an association or community. Cluster analysis still requires that the investigator evaluate the process and the results (Everitt 1979) using a non-abstract situation.

The 114 sites clustered using the criteria of species IV $\geqq$ 0.1 resulted in 45 plant communities (p.c.) in 3 formations. The 45 plant communities were representative of 11 vegetation series consisting of 2 treeland, 5 shrubland, and 4 grassland formations (table 4). Intracluster variation among sites was significant for 82% of the communities tested, and inter-cluster variation among communities was significant for 73% of the series tested. Therefore, the majority of sites and communities were considered statistically and ecologically different as classified.

Table 4.—Plant community classification, community number and name, and number of sample sites for the Upper Rio Puerco Watershed.

Formation	Subformation	Community	No. Sites
Treeland	*Pinus*	1. Pipo/CARE-Bogr	3
		2. Pipo-Pied/Bogr-CARE	1
		3. Pied/Bogr-ERIO	1
		4. Pied-Jumo/Oppo/Bogr	1
		5. Pied/Quga/Hija-Spne	1
	Juniperus	6. Jumo/Gusa/Bogr-Hija	4
		7. Jumo/Bogr	4
		8. Jumo/Artr/Hija-Spcr	1
Shrubland	*Artemisia*	9. Artr/Bogr-Hija	7
		10. Artr-Gusa/Bogr-Hija	3
		11. Artr/Bogr-Hija-Spai	4
		12. Artr-Gusa/Hija-Spai	2
		13. Artr-Gusa/Bogr-Agsm	6
		14. Artr/Spcr-Orhy	1
		15. Artr-Chpa/Arfe-Bogr	1
		16. Arno-Artr/Agcr-Agsm	1
		17. Arno-Gusa/Bogr-Hija	1
	Chrysothamnus	18. Chnab/Bogr-Agsm	1
		19. Chpa/Hija-Bogr	3
		20. Chnag/Bogr-Agsm	1
	Sarcobatus	21. Save	2
		22. Save/Sihy-Agsm	1
	Ceratoides	23. Cela-Gusa/Hija	7
		24. Cela-Gusa/Bogr	3
	Atriplex	25. Atcu-Frja/Spai	1
		26. Atob/Spai-Spcr	2
		27. Atob-Gusa/Hija-Spai	2
		28. Atca/Hija	1
		29. Atca/Spai-Sihy	4
		30. Atca-Gusa/Bogr-Spcr	2
Grassland	*Bouteloua*	31. Bogr-Hija	2
		32. Gusa/Bogr-Hija	8
		33. Gusa/Bogr-Boer	1
		34. Bogr-Spai	1
		35. Gusa/Boer-Hija	2
	Hilaria	36. Gusa/Hija-Bogr	6
		37. Hija-Spai	5
		38. Gusa/Hija-Spcr	1
	Sporobolus	39. Spai	1
		40. Spai-Bogr	5
		41. Spai-Hija	4
		42. Gusa/Spai-Hija	2
		43. Spai-Agsm	2
		44. Spne-Boer	1
	Scleropogon	45. Scbr-Bogr	1

Initially, the plant communities were determined by setting the dendrogram dissimilarity index level (Euclidean distance) at approximately 0.565 (fig. 5). However, this dissimilarity level produced communities, in some cases, which were confounded by unlike species and lifeform. Therefore, an ordered printout of site summaries (table 5) which followed the horizontal dendrogram axis listing of sites was used to determine realistic clusters and species dominance. The sites were combined into communities based on species IV $\geq$ 0.1, if an individual species IV rank and lifeform dominated the site. For example, the first cluster formed at index 0.565 consisted of 10 sites: 1, 141, 152, 37, 136, 142, 140, 144, 143, and 145 (fig. 5). Selecting the species by lifeform with the greatest IV from each site led to all of the sites within the same formation—shrubland. Sites 1 and 152 were classified as Artr *(Artemisia tridentata)*-Gusa *(Gutierrezia sarothrae)*/Bogr *(Bouteloua gracilis)*-Hija *(Hilaria jamesii)* (p.c. 10) (table 5); site 141 was combined with sites 142, 140, 144, 143, and 145 and classified as Artr-Gusa/Bogr-Agsm *(Agropyron smithii)* (p.c. 13) (table 5); sites 37, 5, 146, 7, 9, 23, and 22 classified as Artr/Bogr-Hija (p.c. 9) (fig. 5, table 5). Note that sites 5, 146, 7, and 9 formed a realistic cluster and that sites 37, 23, and 22 were clustered with other sites and had to be recombined using site summary data (table 5). For example, site 22 (p.c. 9) was clustered with site 19 (p.c. 32). Boyd (1984) also found that the interpretation and refinement of clusters was necessary for ecologically meaningful communities.

An example of a realistic cluster requiring no additional combining was the grouping of sites 103, 104, 106, and 108 (fig. 5) which were classified as Jumo *(Juniperus monosperma)*/Gusa/Bogr-Hija (p.c. 6).

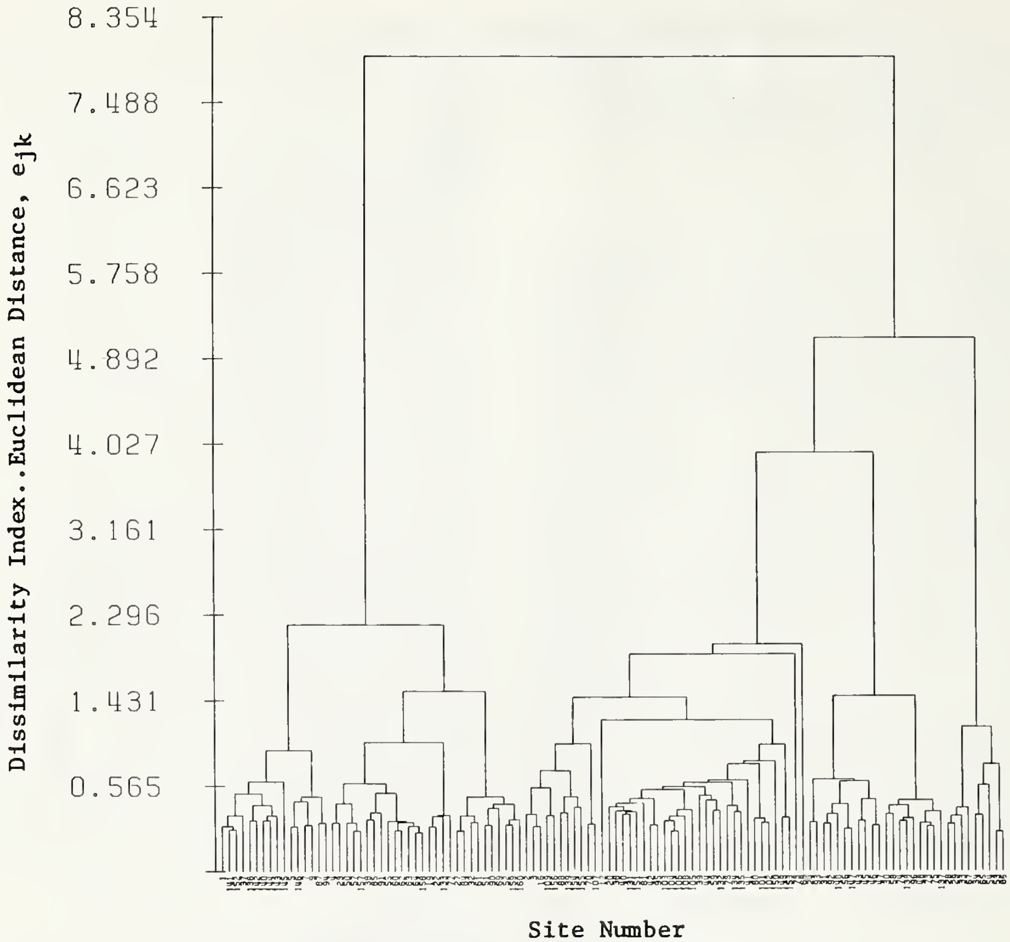

Figure 5.—Dendrogram of sample sites based on importance values for all species with IV $\geq$ 0.1; non-standardized data. A partial site summary and site linkage used to form plant communities are shown in table 5.

Therefore, inconsistent clusters which confounded lifeform and individual species required that each cluster of sites be examined using the dendrogram in relation to the site summaries. The result was 45 plant communities named for the dominant or co-dominant species by lifeform with an IV $\geq$ 0.1 (tables 6–50).

The hypothesis that Ward's method and dissimilarity coefficients calculated from species IV $\geq$ 0.1 would provide distinct, realistic clusters was rejected based on the results of this study. However, the dendrogram and associated ranked site summary data provided a point of approximation for plant community descriptions.

In some cases, the classified plant communities were very similar and/or were developed from only one or two sites. For example, the *Artemisia* subformation (table 4) contained four communities with Bogr as the dominant grass species; but it was thought that the co-dominant species, Hija, Spai (*Sporobolus airoides*), and Agsm, occurred in sufficient amounts in different sites to warrant separation into different communities. Plant communities containing Gusa in significant amounts were separated because of the apparent lower ecological stage of the sites. Even though there have been conflicting reports as to the ecological status of Gusa—broom snakeweed (Jameson 1970, Ueckert 1979, McDaniel et al. 1982), indications are that snakeweed is a rapid invader and intense competitor in disturbed sites.

Plant communities consisting of only one or two sample sites were maintained as separate because of their unique floristics, management implications, or ecological status. For example, the *Chrysothmnus* subformation contained two communities of one site each (table 4); but the communities were composed of two subspecies which may respond differently to management, such as herbicide treatment, or may represent an edaphic or climatic microsite important for seeding or fertilizer application. Also, a community such as Spne (*Sporobolus nealleyi*)-Boer (p.c. 44) represented a unique edaphic situation in that Spne is specific to gypsum soil and Boer represented a plant community in a higher ecological stage. Another one-site example is the *Scleropogon* community (p.c. 45). This community was not widespread, but represented a potential natural vegetation association (Donart et al. 1978).

PHYTO-EDAPHIC COMMUNITY DESCRIPTIONS

The 45 plant communities based on plant species importance values (IV) $\geq$ 0.1 were classified and describ-

Table 5.—Partial site summary of species variables following the horizontal dendrogram axis—site number (fig. 5). Listed are five species with the highest IV $\geq$ 0.1. Species in boldface were used to form and name the plant community (p.c.). Solid lines connecting the sites indicate all of the sites used to form a p.c.; broken lines indicate some of the sites.

P.C. No.	Site No.	Species	Cover (%)	Density (No.)	Frequency (%)	IV
	1	**Bogr**	3.800	24.33	60	.789
	1	**Hija**	3.270	11.07	97	.566
	1	**Artr**	10.500	0.77	40	.517
	1	Stne	1.630	2.37	70	.262
	1	**Gusa**	2.070	1.00	50	.209
10						
	141	**Bogr**	6.288	7.90	70	.816
	141	**Artr**	5.550	1.00	30	.403
	141	**Agsm**	1.038	4.30	35	.314
	141	Hija	0.863	4.70	20	.281
	141	**Gusa**	2.538	0.45	30	.227
	152	**Bogr**	3.975	22.90	80	.801
	152	**Artr**	1.792	1.57	63	.537
	152	**Hija**	3.408	8.73	50	.437
	152	**Gusa**	2.258	2.43	77	.314
	152	Sihy	0.542	4.07	63	.235
	37	**Artr**	12.800	1.83	80	.861
	37	**Hija**	3.100	17.00	90	.821
9	37	**Bogr**	3.700	15.67	73	.770
	37	Agsm	0.300	2.17	37	.168
	37	Agcr	0.330	0.60	20	.085
13						
	136	**Bogr**	24.350	16.60	80	1.373
	136	**Agsm**	2.013	11.95	50	.550
18	136	Hija	1.288	4.00	25	.229
	136	Spcr	0.600	1.75	35	.186
	136	**Chnab**	5.200	0.00	00	.138
	142	**Bogr**	21.775	21.60	100	1.219
	142	**Artr**	17.650	0.90	60	.572
	142	**Agsm**	1.650	15.70	80	.569
	142	**Gusa**	0.375	2.90	90	.278
	142	Psta	0.125	1.80	40	.134
	140	**Bogr**	7.788	7.70	60	.726
	140	**Agsm**	1.650	13.15	65	.609
	140	Hija	2.288	6.85	35	.412
	140	**Artr**	4.538	1.10	34	.331
	140	Spai	2.975	1.90	10	.214
	140	**Gusa**	0.625	0.55	20	.100
	144	**Agsm**	1.713	12.30	45	.500
	144	Agde	4.763	5.25	60	.489
	144	**Bogr**	3.888	6.25	55	.464
	144	**Artr**	5.000	0.90	40	.344
	144	Astr	1.763	2.50	40	.233
	144	**Gusa**	0.325	1.55	40	.140
	143	**Bogr**	9.175	16.60	00	.841
	143	**Artr**	12.185	2.90	70	.809
	143	**Agsm**	0.775	10.10	90	.604
	143	Agde	1.175	3.40	40	.272
	143	**Gusa**	0.225	0.40	40	.149
	145	**Artr**	13.275	2.80	50	1.025
	145	**Agsm**	2.075	16.10	40	.939
	145	Sihy	0.675	2.30	60	.390
	145	Agde	1.575	2.00	50	.381
	145	Cela	1.125	1.20	20	.195
	145	**Bogr**	0.275	0.00	00	.014

ed with their associated landform; soil series, association, or complex; ecological stage; and potential natural vegetation (PNV). The combined factors designated a phyto-edaphic community (Tiedeman and Terwilliger 1978). The classification followed a hierarchical-agglomerative-polythetic approach (Sneath and Sokal 1973, Pielou 1977) based on the ecological concepts of numeric classification (Goodall 1978, Romesburg 1984) and floristic-dominance types (Westhoff and van der Maarel 1978, Whittaker 1978) within stratal units (Barkman 1978). The vegetation of each community has been described in the existing vegetation context for identifiable units in the field. Ecological stage was based on quantitative community data, existing vegetation seral stage in relation to PNV, and soil-site degradation. PNV is hypothetical, stable, and based on existing vegetation projected into some undefined future, accounting for current site conditions and minimum human disturbance (Mueller-Dombois and Ellenberg 1974, Schlatterer 1978). PNV should not be confused with the original or pristine vegetation. Quantitative results and objective judgment indicated that most of the existing phyto-edaphic communities were in a mid-to-high seral stage, but degraded.

Detailed soil profiles are in Appendix A. Species symbols, scientific names, authority, and common names are in Appendix B. The typal plant community vegetation and soil surface factor data are in tables 6–50. For some minor species, the mean or total for IV, cover, density, or frequency may be shown as zero (0.0) because of rounding or the number of digits carried (e.g., table 6). For some communities consisting of only one site, there are no range data (e.g., table 7).

A dichotomous key to the phyto-edaphic communities is presented in Appendix C. Each vegetation subformation includes a representative community photo. The plant community descriptions are grouped by formation, subformations, series, and communities within series; each plant community is numbered (p.c. 1–45).

The plant communities were named according to the dominant and/or co-dominant plant species within each lifeform synusia. Plant species were considered dominant or co-dominant if they had the greatest IV rank for their specific lifeform. Species were listed in the following order: tree/shrub/forb/grass or grasslike. Lifeforms were separated by a slash (/), co-dominants within a lifeform were separated by a dash (-).

Treeland Formation...*Pinus* Subformation ...*P. ponderosa, P. edulis* Series

The five communities classified within the *Pinus* subformation consisted of sites which had ponderosa pine (*Pinus ponderosa*) and/or pinyon pine (*Pinus edulis*) dominating the tree synusia with an IV $\geq$ 0.1 and at least one shrub, forb, grass, or grasslike as a dominant understory synusia (fig. 6). The series occurred on three soil orders and seven different soil series and/or associations. The *Pinus* subformation occurred on two landforms at the higher study area elevations, and the communities were not considered as major within the study area.

Figure 6.—Representative photo of the *Pinus* subformation. Pictured is the *Pinus ponderosa/Carex* spp. - *Bouteloua gracilis* plant community (p.c.1).

1. *Pinus ponderosa/Carex* spp.-*Bouteloua gracilis* p.c.

(Pipo/CARE-Bogr; ponderosa pine/sedge-blue grama)

General: This community represented the most common treeland community within the study area. The community was represented by three sites between 2,286 m and 2,438 m in elevation.

Landform: Mesas and colluvial slopes.

Soils: Ustic/Lithic Torriorthent, Shingle-Travesilla series (Assoc.Al);
Lithic Argiustoll, Cabezon series (table 3).

In general, soils were shallow, loamy, well-drained, and formed from mixed colluvial and eolian material. A modal profile was less than 76 cm in depth, with an effective soil depth of less than 25 cm (Appendix A, figs. A1 and A7). Two of the three sites occurred on soil association A1. Bare soil and litter averaged 74.2% and 21.7%, respectively (table 6).

Vegetation: Pipo contributed 21.7% and 62.5% of the total IV and cover of this community, respectively (table 6). Eight of the 34 species contributed nearly 80% or greater of the totals for IV, cover, density, and frequency at IV $\geq$ 0.1. Pied (*Pinus edulis*) and Quga (*Quercus gambelii*) occurred, but in minor amounts. Hyri (*Hymenoxys richardsonii*) ranked number 3 for IV and number 1 for frequency, but was not included as part of the community name. Pofe (*Poa fendleriana*) was a major component in two of the three sites.

Ecological Stage: Mid-seral.

PNV: Current vegetation with increased amounts of Bohi (*Bouteloua hirsuta*), Agsm (*Agropyron smithii*), Cemo (*Cercocarpus montanus*), Kocr (*Koeleria cristata*), and Pofe for a higher ecological stage.

2. *Pinus edulis - P. ponderosa/Bouteloua gracilis-Carex* spp. p.c.

(Pied-Pipo/Bogr-CARE; pinyon-ponderosa pine/blue grama-sedge)

General: This community may be considered as a phase of p.c. 1, or possibly an ecotone between p.c.1 and p.c.4. However, the community was representative of a definite community structure dominance change from p.c.1 between Bogr-CARE and Pipo-Pied. The community occurred at an elevation of 2,181 m.
Landform: Mesa.
Soils: Ustic/Lithic Torriorthent, Shingle-Travessilla series (Assoc.A1) (table 3).
Soils in this association were classified as Entisols and were calcareous, loamy, mixed, shallow, and well-drained. The effective soil depth was less than 50 cm, and pH ranged between 8.0 and 8.2 (Appendix A, fig. A1). Bare soil and litter averaged 69.6% and 24.6%, respectively (table 7).
Vegetation: Bogr contributed 25.8% and 51.2% of the total IV and density, respectively (table 7). Pied contributed 11.2% and 33.1% of the IV and cover, respectively. Of the 23 plants in this community, seven contributed greater than 75% to the variable totals at IV $\geq$ 0.1. Chvi2 (*Chrysopsis vellosa*) had an IV = 0.563 and a frequency of 91%, but was not included in the community name. Artr (*Artemisia tridentata*), Jumo (*Juniperus monosperma*), Kocr, and Quga were minor components.
Ecological Stage: High-seral.
PNV: Current community with increased amounts of SPOR (*Sporobolus* spp.), Kocr, and Hija (*Hilaria jamesii*) for a higher sere. If Gusa (*Gutierrezia sarothrae*), Quga, or SENE (*Senecio* spp.) increase, the seral trend will be downward indicating a perturbation.

3. *Pinus edulis/Bouteloua gracilis - Eriogonum* spp. p.c.

(Pied/Bogr-ERIO; pinyon pine/blue grama-buckwheat)

General: This is a minor community, but very common on steep, rocky slopes at elevations from 1,524 m to 2,438 m.
Landform: Steep, rocky colluvial slopes.
Soils: Mollic Haplargid, Penistaja-sandstone series (table 3).
This Aridisol soil had an effective depth of about 50 cm (Appendix A, fig. A6). It was well-drained, formed in mixed alluvium and eolian sediments, and was sandy to clay loam in texture with occasional sandstone outcrops. The surface rock of this community was greater than 20%, and bare soil and litter averaged 70.0% and 1.6%, respectively (table 8).
Vegetation: Buckwheat species accounted for nearly 50% of each of the vegetation variable totals (table 8). Bogr ranked number 2 for IV and density, and Pied ranked number 3 and 1 for IV and cover, respectively. The majority of ERIO species and Bogr occurred as evenly spaced components under Pied. Jumo, Gusa, Hija, and Orhy (*Oryzopsis hymenoides*) were minor components.
Ecological Stage: Low-seral.
PNV: Current composition with increased Hija, Orhy, and MUHL (*Muhlenbergia* spp.) would yield a higher seral stage. Obtaining a higher sere may be unreasonable on steep, rocky slopes.

4. *Pinus edulis-Juniperus monosperma/Opuntia polyacantha/Bouteloua gracilis* p.c.

(Pied-Jumo/Oppo/Bogr; pinyon pine – one-seed juniper/prickly pear cactus/blue grama)

General: This community appears to be a minor, yet, important component within the study area because of composition, low diversity, and SR. Elevation of the study site was 2,225 m.
Landform: Mesa.
Soils: Basalt Outcrops-Orthents-Ustolls (Complex C1) (table 3).
This map unit complex consisted of 30–50% basalt outcrops, 20–40% Orthents, and 20–40% Ustolls. Effective soil depth was 25 cm to 76 cm with variable textures, but usually stoney to clay loam (Appendix A, fig. A8). Mean values for litter, rock, and bare soil were 14.5%, 2.2%, and 77.4%, respectively (table 9).
Vegetation: Bogr accounted for 45.7% and 75.1% of the total IV and density components, respectively (table 9). Ranked second for IV, density, and frequency was Oppo, indicating a degraded, xeric community. Pied accounted for about 20% of the total cover and Jumo accounted for about 30% of the total cover; only three grass species occurred in the sample community. Six of the 10 species accounted for 90% or greater of each variable total.
Ecological Stage: Low-mid seral.
PNV: Current community plus increased amounts of Hija and Sihy (*Sitanion hystrix*) for higher seral stage with Oppo and Gusa niches filled by grasses.

5. *Pinus edulis/Quercus gambelii/Hilaria jamesii-Sporobolus nealleyi* p.c.

(Pied/Quga/Hija-Spne; pinyon pine/gambel oak/galleta-gypgrass)

General: This is a minor community, sampled at low intensity, but unique and included because of its occurrence on gypsum soils. The sample site was at an elevation of 1,829 m.
Landform: Mesas.
Soils: Rock outcrops-gypsum (Complex C3) (table 3).
Rock outcrops and gypsum land made up 30–50% of this complex, respectively. The complex occurred on steep ridges, bluffs, and breaks. The gypsum land usually occurred as nearly pure and weathered with unstable, erodible surfaces. The rock outcrops were sandstone, shale, hard gypsum (Appendix A, fig. A8). The Pied/Quga/Hija-Spne community was unique to this soil. Bare soil averaged 95%, litter 3.3%, and surface rock 0% (table 10).
Vegetation: Hija and Spne were ranked number 1 and 2, respectively for IV, density, and frequency (table 10). Quga and Pied were ranked number 1 and 2 for cover, respectively. Mean plant density was low (3.4), and 8 of the 13 species accounted for greater than 88% of the total IV, cover, and density values. Total herbaceous cover

was only 1.7%. The community was actually dominated by Hija with an overstory cover synusia dominated by Pied and Quga; similar to the pinyon-juniper-oak association (CW1a) of Donart (1978).
Ecological Stage: Mid-seral; somewhat degraded with the presence of Gusa.
PNV: Existing community with increased dominance of Spne and Orhy under effective management and decreased Gusa.

Treeland Formation...*Juniperus* Subformation ...*J. monosperma* Series

The three communities classified within the *Juniperus* subformation consisted of sites which had Jumo dominating the tree synusia with an IV $\geqq$ 0.1 and at least one shrub, forb, grass or grasslike as a dominant understory synusia (fig. 7). The series occurred on three soil orders, two complexes, and three landforms. The series was not a major areal component of the study area.

6. *Juniperus monosperma/Gutierrezia sarothrae/Bouteloua gracilis-Hilaria jamesii* p.c.

(Jumo/Gusa/Bogr-Hija; one-seed juniper/snakeweed/ blue grama-galleta)

General: This community occurred at elevations between 1,768 m and 2,012 m and was represented by four sites; it was indicative of degraded site conditions.
Landform: Breaks and colluvial slopes.
Soils: Ustic/Lithic Torriorthent, Shingle-Travessilla series (Assoc.Al);
Basalt outcrops-Orthents-Ustolls (Complex C1);
Rocky outcrops-Orthents (Complex C2) (table 3).

This community occurred on Entisols represented by two series (one association) and two complexes. These soils were generally shallow with an effective soil depth of less than 50 cm (Appendix A, figs. A1 and A8). Bare

Figure 7.—Representative photo of the *Juniperus* subformation. Pictured is the *Juniperus monosperma/Bouteloua gracilis* plant community (p.c.7).

soil and surface rock averaged 60.5% and 18.6%, respectively (table 11). Textures were silty to clay loam, mineralogy was mixed, and most sites were calcareous. The community was not soil specific.
Vegetation: Bogr and Hija essentially shared the number 1 rank for IV, and frequency; but Bogr dominated cover and density for herbaceous species (table 11). Gusa was ranked third in IV, while Jumo dominated the cover values by contributing 19.2% of the total cover. Seven species represented greater than 65% of the total for each variable. This community primarily differs from p.c. 7 by the co-dominance of Bogr and Hija; Bogr dominated the IV in p.c. 7, and Jumo cover is about doubled. Gusa is approximately the same for all variables in both p.c. 6 and p.c. 7. Pied contributed only 0.9% and 2.8% of the total IV and cover, respectively.
Ecological Stage: Mid-seral.
PNV: Higher ecological stage by increasing Boer (*Bouteloua eriopoda*), Bocu (*Bouteloua curtipendula*), Spai (*Sporobolus airoides*), Sihy, Cemo, and Agsm; and by decreasing Gusa, Arlo (*Aristida longiseta*), and Hyri. Jumo will be a permanent community member.

7. *Juniperus monosperma/Bouteloua gracilis* p.c.

(Jumo/Bogr; one-seed juniper/blue grama)

General: This community is the typal of four sites and occurred at elevations between 1,798 m and 2,012 m. It differs from p.c. 6 primarily in the dominance of Bogr and Jumo.
Landform: Breaks and colluvial slopes.
Soils: Ustic Torripsament/Torrifluvent, Sheppard-Unnamed 13 (Assoc. A9);
Lithic Argiustoll, Cabezon series;
Rock outcrops-Orthents-Ustolls (Complex C1) (table 3).

This community occurred on two soil orders, Entisol and Mollisol, represented by three series and one complex. The Entisol series were relatively deep, with effective depths of greater than 127 cm (Appendix A, figs. A3 and A8). Textures were loamy-sand and clay with mixed mineralogy; pH average about 8.6. The Mollisol series was shallow with an effective depth of 3.8 cm, a pH of 7.0, and clayey texture (Appendix A, fig. A7). One site occurred on each of the soils. Bare soil equalled 74.0%, rock 11.4%, and litter 7.9% (table 12).
Vegetation: Bogr dominated the IV, density, and frequency variables with 35.3%, 65.0%, and 24.7% of the totals, respectively (table 12). Jumo contributed 40.3% of the total cover. Five of 44 species contributed about 80% or greater of the total IV, cover, and density totals. This community differs from p.c. 6 in that Jumo cover was twice as large and Bogr was not co-dominant with Hija. Also, Gusa was more pronounced in p.c. 6, and bare soil was about 15% less and rock was about 7% greater.
Ecological Stage: Mid-high seral.
PNV: Existing community with increased amounts of Spcr (*Sporobolus cryptandrus*), Boer, and Orhy for a higher ecological stage and decreased amounts of Gusa,

Muto *(Muhlenbergia torreyi)*, and infrequent species. Jumo is a persistent component, along with Pied in very minor amounts.

8. *Juniperus monosperma/Artemisia tridentata/Hilaria jamesii-Sporobolus cryptandrus* p.c.

(Jumo/Artr/Hija-Spcr; one-seed juniper/big sagebrush/ galleta-sand dropseed).

General: This community was not well sampled, but formed a unique floristic group common along break slopes or mesa tops. It occurred at an elevation of 2,012 m and differs from p.c. 6 and p.c. 7 by the co-dominance of Jumo and Artr.
Landform: Mesas.
Soils: Mollic/Lithic Haplargid, Penistaja-Bond series (Assoc. A8) (table 3).

The Aridisols in this soil association were relatively shallow with an effective depth of 38–76 cm; texture was fine-loamy with a pH of 8.2 (Appendix A, fig. A6). Bare soil, litter, and rock averaged 72.4%, 19.7%, and 1.5%, respectively (table 13).
Vegetation: Hija and Spcr essentially shared IV dominance contributing 29.0% and 24.7% of the total, respectively; Artr contributed 13% of the total (table 13). Also, Hija and Spcr dominated the density and frequency totals. Cover values were dominated by Artr contributing 31.9% of the total, followed by Hija and Jumo. Seven species represented greater than 90% of the IV, cover, and density total values. The community was somewhat degraded with Gusa occurring in 30% of plots; and Agsm and Orhy were not well represented.
Ecological Stage: Mid-high-seral with degraded aspect.
PNV: Existing community with increased amounts of Sihy, Agsm, Orhy, and Spai to obtain high seral stage. Artr and Jumo are permanent occupants.

Shrubland Formation...*Artemisia* Subformation ...*A. tridentata, A. nova* Series

Nine communities were classified within the *Artemisia* subformation which consisted of sites that had Artr or Arno *(Artemisia nova)* dominating the shrub synusia with an IV $\geq$ 0.1 and at least one forb, grass or grasslike as a dominant understory synusia (fig. 8). The series occurred on three soil orders, none of the complexes, and all landforms. The subformation was a major component of the study area.

9. *Artemisia tridentata/Bouteloua gracilis-Hilaria jamesii* p.c.

(Artr/Bogr-Hija; big sagebrush/blue grama-galleta)

General: This community occurred at elevations between 2,073 m and 2,195 m and was common within the study area occupying several soils.

Figure 8.—Representative photo of the *Artemisia* subformation. Pictured is the *Artemisia tridentata/Bouteloua gracilis-Hilaria jamesii* plant community (p.c.9).

Landform: Mesas and alluvial flats.
Soils: Typic Torripsament, Berent series;
Ustollic Camborthid, Las Lucas-Unnamed 7B series (Assoc.A6);
Mollic/Lithic Haplargid, Penistaja-Bond series (Assoc. A8);
Ustic Haplargid/Torriorthent, Poleo-Unnamed 2 (Assoc. A4) (table 3).

This community occurred on one series and three associations within the Entisol and Aridisol orders; one of the associations (A4) was on Aridisol-Entisol mix. Textures ranged from sandy to fine-loamy with mixed minerology. Most of the soils were deep, with an effective soil depth greater than 152 cm; the Bond series in Association A8 was shallow and probably did not support a site within the community (Appendix A, figs. A2, A4, A5, and A6). Bare soil and litter averaged 79.7% and 9.1%, respectively (table 14).
Vegetation: Bogr dominated all variables with values of 47.1%, 43.0%, 76.0%, and 27.1% of the total IV, cover, density, and frequency, respectively (table 14). Artr was ranked second for all variables except density, and Hija was ranked third for all variables except density for which it ranked second. Of the 23 species, 4 accounted for greater than 85% of the IV, cover, and density totals and therefore the low diversity index. Artr accounted for almost 50% of the total community cover. Spcr was a constant community member.
Ecological Stage: Mid-seral.
PNV: Existing plant composition with increased amounts of Agsm, Spai, and Cela *(Ceratoides lanata)* for a higher seral stage. Gusa will probably retain its spatial and functional niche, but in minor amounts under proper management.

10. *Artemisia tridentata-Gutierrezia sarothrae/Bouteloua gracilis-Hilaria jamesii* p.c.

(Artr-Gusa/Bogr-Hija; big sagebrush-snakeweed/blue grama-galleta)

General: This community is essentially the same as p.c. 9, but degraded (fair condition) because of the status of snakeweed. Sample site elevations were between 2,103 m and 2,195 m.

Landform: Mesas and alluvial flats.

Soils: Ustollic Camborthid, Atrac-Unnamed 4 series (Assoc. A5);
Ustollic Haplargid/Torriorthent, Poleo-Unnamed 2 series (Assoc. A4);
Entic Haplustoll, Prewitt series (table 3).

This community occurred on series within the Aridisol and Mollisol orders. Each site was on a different soil; all soils were fine-loamy textured, which accounted for the prevalence of Artr and Gusa. All of the soils exceeded a depth of 127 cm, except for the Unnamed 4 series which probably did not support this community (Appendix A, figs. A2, A5, and A7). Bare soil and litter was 77.8% and 10.5%, respectively (table 15).

Vegetation: As with p.c. 9, Bogr ranked first for all variable accounting for 35.5%, 30.5%, 56.4%, and 18.9% of the totals for IV, cover, density, and frequency, respectively (table 15). Hija ranked second, except for cover which was accounted for by Artr with 28.7% of the total. Gusa was ranked fourth in IV and cover, but occurred in nearly one-half of all plots with a frequency of 48.0%. Therefore, this community was separated from p.c. 9. Six species accounted for greater than 85% of the totals for IV, cover, and density.

Ecological Stage: Mid-seral, but degraded.

PNV: Existing vegetation with increased amounts of Agsm, Orhy, Spai, and Cela; and decreased amounts of Gusa and Hija with proper management.

11. *Artemisia tridentata/Bouteloua gracilis-Hilaria jamesii-Sporobolus airoides* p.c.

(Artr/Bogr-Hija-Spai; big sagebrush/blue grama-galleta-alkali sacaton)

General: This community had similar vegetation to p.c. 9 and p.c. 10, but with three dominant grass species and minor amounts of snakeweed. Site elevations were between 2,073 m and 2,164 m. Also, soils were formed in alluvial deposits and differed from p.c. 9 and p.c. 10.

Landform: Alluvial flats.

Soils: Typic Torrifluvent, Christainburg series;
Typic Torrifluvent, Fruitland series;
Ustic Haplargid/Torriorthent, Poleo-Unnamed 2 series (Assoc. A4) (table 3).

This big sagebrush community occurred only on Entisols which were fine to coarse-loamy and mixed. All of the soils were greater than 152 cm deep, with A-horizons less than 25 cm (Appendix A, figs. A2 and A4). The Poleo series in Association A4 was an Aridisol, but probably did not support one of the sample sites. Bare soil was 81.8% and litter was 5.4% (table 16).

Vegetation: Bogr and Hija were ranked first and second, and contributed almost identical percentages to the total values of IV, cover, density, and frequency (table 16). Spai was ranked third, contributed approximately 18% to the four variable totals, and, therefore, was included in the community name. Artr was ranked fourth for IV, density, and frequency, and second for cover. The four species after which the community was named, accounted for 90% or more of the total IV, cover, and density values, and, therefore, the relatively low diversity index of 1.19.

Ecological Stage: High-seral.

PNV: Current community plus increased amount of Agsm, Spai, and Orhy to maintain a high-seral stage with proper management. Gusa occurred in three sites, but in minor amounts.

12. *Artemisia tridentata-Gutierrezia sarothrae/Hilaria jamesii-Sporobolus airoides* p.c.

(Artr-Gusa/Hija-Spai; big sagebrush-snakeweed/galleta-alkali sacaton)

General: The community was similar to p.c. 11 but with a reversal in species dominance and somewhat degraded with an increase of snakeweed. The two sites within this community occurred at elevations of 2,103 m and 2,164 m on slopes.

Landform: Colluvial and alluvial slopes.

Soils: Ustollic Camborthid, Atrac-Unnamed 4 series (Assoc. A5);
Ustollic Haplargid/Torriorthent, Poleo-Unnamed 2 series (Assoc. A4) (table 3).

This community occurred on Aridisols which formed two associations consisting of four series. The Poleo series in Association A4 is an Entisol, and probably did not support a sample site. All series except Unnamed 4 were deeper than 152 cm and had shallow A-horizons and B-horizons of about 51 cm in depth (Appendix A, figs. A2 and A5). Textures were fine-loamy and mixed. Litter was only 5.9% and bare soil averaged 85.7% (table 17), which probably accounted for the increased amount of Gusa along with eroded slopes of up to 10% or greater.

Vegetation: Hija and Spai contributed about equally to IV, cover, density, and frequency totals, and Artr dominated the cover variable contributing 41.1% of the total (table 17). Bogr was ranked fourth, and Gusa occurred in 32% of the sample plots with a cover value of nearly 5% of the total. Seven of the 17 species accounted for 90% or greater of the four variable totals. Hija and Spai were co-dominant, whereas Bogr and Hija were co-dominants in p.c. 11 including an increase in Gusa. These characteristics were the major separation factors between p.c. 11 and p.c. 12.

Ecological Stage: Mid-seral.

PNV: Existing community structure with increased amount of Agsm and Orhy, and decreased Gusa for a higher seral stage.

13. *Artemisia tridentata – Gutierrezia sarothrae/Bouteloua gracilis-Agropyron smithii* p.c.

(Artr-Gusa/Bogr-Agsm; big sagebrush-snakeweed/blue grama-western wheatgrass)

General: This community differs from p.c. 10, 11, and 12 because of the co-dominance of Bogr and Agsm, and a decreased Hija component. Sites occurred between 1,981 m and 2,256 m in elevation.

Landform: Alluvial flats.

Soils: Ustic Torriorthent, Galisteo-Unnamed 2+2B series (Assoc. A3);
Typic Torrifluvent, Christainburg and Fruitland series;
Mollic/Lithic Haplargid, Penistaja-Bond series (Assoc. A8) (table 3).

This community occurred on both Entisols and Aridisols represented by seven different series. Most of the soils were fine-loamy texture and mixed. All soils were greater than 152 cm depth, except for the two series in Association A8 (Appendix A, figs. A2, A4, and A6). A-horizons in the series were generally less than 13 cm in depth. Bare soil averaged less than 70%, litter was 16.0%, and no surface rock (table 18).

Vegetation: Bogr and Agsm contributed about equally to the IV, density, and frequency totals (table 18). Actually, Bogr, Agsm, and Artr each contributed about 20% to the IV total. Artr ranked first for cover and second with Bogr for frequency. Although seven species had an IV $\geqq$ 0.1, only the top three occurred in the six sites used to define this community. The same seven species accounted for greater than 80% of the IV, cover, and density totals.

Ecological Stage: Mid-high seral, somewhat degraded.

PNV: Increased amounts of Sihy, Spcr, Spai and Orhy for high ecological stage. Artr is a permanent component as is Gusa, but reduced in amount.

14. *Artemisia tridentata/Sporobolus cryptandrus-Oryzopsis hymenoides* p.c.

(Artr/Spcr-Orhy; big sagebrush/sand dropseed-Indian ricegrass)

General: This was a minor community as far as representation within the study area, but approached one of the few high ecological stage communities. Elevation of the community was 2,134 m.

Landform: Alluvial flat.

Soils: Lithic/Typic Torriorthant, Travessilla-Persayo series (Assoc. A2) (table 3).

This Entisol association was loamy, mixed, and shallow. Effective soil depth was less than 25 cm; both series had A1-horizons less than 13 cm deep (Appendix A, fig. A1). Litter averaged 17.2%, bare soil was 64.9% (table 19).

Vegetation: Spcr dominated the IV, cover, density, and frequency variable totals with 45.6%, 59.9%, 48.5%, and 28.4%, respectively (table 19). Artr ranked second for all variables. The IV for Orhy was $\geqq$ 0.1; therefore it was considered important enough to be included in the community name, even though it was a somewhat minor component. Seven species contributed to greater than 80% of the totals for IV, cover, and density.

Ecological State: High seral.

PNV: Existing community with increased amounts of Orhy and Agsm. Artr is a permanent component. Control of Chna *(Chrysothamnus nauseosus)* and Gusa would maintain the seral stage.

15. *Artemisia tridentata-Chrysothamnus parryi/Aristida fendleriana-Bouteloua gracilis* p.c.

(Artr-Chpa/Arfe-Bogr; big sagebrush-Parry rabbitbrush/Fendler threeawn-blue grama)

General: This community was minor, but represented a degraded situation; therefore, it was separated. The sample site occurred at 2,073 m elevation.

Landform: Alluvial flat.

Soils: Typic Torrifluvent, Christainburg series (table 3).

This Entisol was deep, with an effective soil depth of greater than 152 cm (Appendix A, fig. A4). The A1-horizon was less than 13 cm deep. All horizons were clayey with a pH of 8.6. Litter and bare soil averaged 17.7% and 70.6%, respectively (table 20).

Vegetation: Arfe ranked number one for all variables and contributed 21.6%, 24.5%, 22.4%, and 11.6% to total IV, cover, density, and frequency, respectively (table 20). Bogr ranked second for IV and density; Artr and Chpa ranked second and third, respectively for total cover. Of the 24 species, 10 contributed greater than 80% of the variable totals.

Ecological Stage: Low seral.

PNV: Existing community with increased Spai, Orhy, and Agsm; decreased Muri *(Muhlenbergia richardsonis)*, Arfe, and Chpa.

16. *Artemisia nova – A. tridentata/Agropyron cristatum – A. smithii* p.c.

(Arno-Artr/Agcr-Agsm; black sagebrush-big sagebrush/crested-western wheatgrass)

General: This is a minor community, but a unique type because of the dominance of Arno. The typal community was at 2,225 m elevation.

Landform: Alluvial flat.

Soils: Ustic Torriorthent, Galisteo-Unnamed 2 + 2B series (Assoc. A3) (table 3).

This Entisol soil association consisted of three series having an effective depth of greater than 152 cm. A1-horizans were less than 13 cm deep with clay to clay-loam textures; pH was 8.2 (Appendix A, fig. A2). Litter, rock, and bare soil averaged 6.8%, 0%, and 87.7%, respectively (table 21). Black sagebrush usually occurs on shallow soils with lime subsoils. Therefore, the sample site of this p.c. may be an inclusion within the soil association or an ecotone.

Vegetation: Arno ranked first, contributing 22.2%, 40.5%, and 16.0% for IV, cover, and frequency, respectively; and fourth for density (table 21). Agcr and Agsm contributed nearly equal percentages to the IV, cover, and frequency totals; Artr ranked second in cover contributing 22.6% of the total. Of the 23 species, 7 accounted for greater than 70% of the variable totals. Even

though Agcr was an introduced species, it was considered part of the PNV and, therefore, was included in the community name. The sample site appears to be converted, and black sagebrush may have been planted, especially because the soil association (A3) does not conform to the species natural requirements.
Ecological Stage: Mid-seral.
PNV: Existing community with retention of Agcr and increased Orhy.

17. *Artemisia nova – Gutierrezia sarothrae/Bouteloua gracilis – Hilaria jamesii* p.c.

(Arno-Gusa/Bogr-Hija; black sagebrush-snakeweed/ bluegrama-galleta)

General: This is a minor community, but unique and representative of a degraded condition. The sample intensity was very low because of site confounding, but was included as a typal example within the study area because of the black sagebrush aspect, soil, and landform. The sample site occurred at 2,195m elevation.
Landform: Breaks.
Soils: Ustic Torripsament/Torrifluvent, Sheppard-Unnamed 13 series (Assoc. A9) (table 3).

This Entisol association consisted of two series with depths of greater than 152 cm (Appendix A, fig. A3). Textures were loamy-sand or clayey. A-horizons were less than 13 cm deep, and each modal profile consisted of at least three C-horizons with pH averaging about 8.8. Bare soil was 81.2%, and litter was 13.4% (table 22). The sample site was confounded and appeared to be an inclusion within soil Association A9; black sagebrush usually occurs on shallow, lime subsoils.
Vegetation: Bogr dominated the IV, density, and frequency totals, and contributed equally along with Gusa and Arno to total cover (table 22). Gusa and Arno were co-dominant for IV, cover, and frequency. Of the 15 species, 6 accounted for greater than 85% of the totals for IV, cover, and density.
Ecological Stage: Low-mid seral.
PNV: Existing vegetation plus increased amount of Mumo (*Muhlenbergia montana*) and Kocr, and decreased Gusa, Lepu (*Leptodactylon pungens*), and Hasp (*Haplopappus spinulosus*) under proper management for higher ecological stage. Site conditons may preclude reduction of Gusa, Lepu, and Hasp. Arno is a permanent component.

Shrubland Formation...*Chrysothamnus* Subformation ...*C. nauseosus* ssp. *bigelovii, C. parryi, C. nauseosus* ssp. *graveolens* Series

The three communities classified within the *Chrysothamnus* subformation consisted of sites which had two subspecies of Chna (*Chrysothamnus nauseosus*), or Chpa (*Chrysothamnus parryi*) dominating the shrub synusia with an IV $\geq$ 0.1 and at least one grass as the dominant understory synusia (fig. 9). These series occurred on two

Figure 9.—Representative photo of the *Chrysothamnus* subformation. Pictured is the *Chrysothamnus parryi/Hilaria jamesii Bouteloua gracilis* plant community (p.c. 19).

soil orders, an azonal alluvial soil, and one landform. The subformation was a major component, but was restricted in area.

18. *Chrysothamnus nauseosus* ssp. *bigelovii/Bouteloua gracilis-Agropyron smithii* p.c.

(Chnab/Bogr-Agsm; Bigelow rubber rabbitbrush/blue grama-western wheatgrass)

General: This is a minor community, but unique because of the rabbitbrush subspecies differentiation. Only two transects were used to describe this abstract community due to site confounding. The sample site elevation was 2,057 m.
Landform: Alluvial flats.
Soils: Ustollic Camborthid, Las Lucas-Unnamed 7B series (Assoc. A6) (table 3).

The series in this Aridisol association were silty-loams with depths of 76 cm or greater. The A1-horizons were less than 13 cm is depth with an 8.2 pH; subsurface pH values averaged 8.8 (Appendix A, fig. A5). Bare soil was 54% and surface litter was 16.3% (table 23).
Vegetation: Bogr ranked first for contributions to IV, cover, density, and frequency total with 45.8%, 64.7%, 44.6%, and 28.1%, respectively (table 23). Agsm was ranked second for all variables except cover, in which Chnab ranked second with 13.8% of the total. Of the 18 species, 6 accounted for 85% or greater of the totals for IV, cover, and density. Chpa, Gusa, and Artr were components, but in minor amounts.
Ecological Stage: Mid-seral.
PNV: Existing vegetation plus increased Sihy, Scpa (*Schedonnardus paniculatus*), and Orhy. Artr probably will replace Chnab. Selective management could be applied to control Chnab.

19. *Chrysothamnus parryi/Hilaria jamesii-Bouteloua gracilis* p.c.

Chpa/Hija-Bogr; Parry rabbitbrush/galleta-blue grama)

General: This community is similar to p.c. 18 and 20 except for the *Chrysothamnus* species and subspecies, and the dominance of Bogr, Hija, and Agsm. The community occurred between 2,042 m and 2,134 m elevation.
Landform: Alluvial flats.
Soils: Typic Torripsament, Berent series;
Typic Torrifluvent, Fruitland series;
Alluvial (table 3).

This community occurred on two Entisol series and azonal alluvial land. The series were greater than 152 cm in depth and ranged from sandy to loamy textures (Appendix A, figs. A4 and A7). A1-horizon pH averaged 7.4 and subsurface pH ranged from 7.6 to 8.8. Litter, rock, and bare soil averaged 10.6%, 0%, and 78.7%, respectively (table 24).
Vegetation: Bogr ranked number one for all variables, and Chpa ranked second for cover accounting for 21.5% of the total (table 24). Spai and Agsm also were components of the community, with IV ≧ 0.1. Seven species with IV ≧ 0.1 accounted for more than 85% of the variable totals.
Ecological Stage: High-mid seral.
PNV: Existing community structure with possible increase and extension of Cela and Orhy.

20. *Chrysothamnus nauseosus ssp. graveolens/Bouteloua gracilis* – *Agropyron smithii* p.c.

(Chnag/Bogr-Agsm; green plume rubber rabbitbrush/blue grama-western wheatgrass)

General: This minor community is similar to p.c. 18 except for a different subspecies of rubber rabbitbrush and a lower diversity. The sample intensity was small because of site confounding and subspecies differences within the sample sites. Elevation of the sample site was 2,057 m.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Ravola series (table 3).

The community sample site occurred on a fine-silty Entisol series with a depth greater than 152 cm. The A1-horizon was 25 cm deep and was silty-clay loam with a pH of 8.8 (Appendix A, fig. A4); only p.c. 20 and 39 occurred on this soil series. Bare soil was 35.4%, one of the lowest for all communities; litter was 24.1%, one of the highest (table 25).
Vegetation: Bogr accounted for 70% or more of the totals for IV, cover, and density (table 25). Chnag was ranked fourth for IV, but second for cover, accounting for 17.4% of the total value. Four of the seven species accounted for greater than 93% of all variable totals. Because of the dominance of Bogr cover (75.1%), this community had a very low diversity index of 0.74. Spcr was a minor component.
Ecological Stage: Mid-seral.
PNV: Existing community with increased amounts of Agsm and Spcr; decreased Chnag.

Shrubland Formation...*Sarcobatus* Subformation ...*S. vermiculatus* Series

Two communities were classified within the *Sarcobatus* subformation, which consisted of sites dominated by Save (*Sarcobatus vermiculatus*) in the shrub synusia with an IV ≧ 0.1 (fig. 10). One community was mono-specific; the other was dominated by an understory grass synusia. The series occurred on only one soil order, soil series, and landform. The series represented a major component of the study area, especially on alluvial flats.

Figure 10.—Representative photo of the *Sarcobatus* subformation. Pictured is the *Sarcobatus vermiculatus* plant community (p.c. 21).

21. *Sarcobatus vermiculatus* p.c.

(Save; black greasewood)

General: This is essentially a degraded phase of p.c. 22 and a single species community dominated by Save. The p.c. occurred between 2,012 and 2,073 m elevation on a single soil series. However, the soil series was not restricted to this community.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Christainburg series (table 3).

This Entisol series supported several communities and had a depth of greater than 152 cm with A1/AC-horizons of less than 25 cm (Appendix A, fig. A4). The texture was clayey with an 8.6 pH. Bare soil was 84.9% and litter averaged 15.1% (table 26).
Vegetation: Save was the predominant species within this community (table 26). Only two other species occurred; Chna was minor, and an annual *Atriplex* sp. (ATRI). The community was named only after Save; the annual component was not included. Shrubs were the only plants within this community. The community exhibited the lowest diversity index with a value of 0.17.
Ecological Stage: Low seral.
PNV: Save with possible invasion by Agsm and Sihy yielding a higher ecological stage similar to p.c. 22.

22. *Sarcobatus vermiculatus/Sitanion hystrix* – *Agropyron smithii* p.c.

(Save/Sihy-Agsm; black greasewood/bottlebrush squirrel tail-western wheatgrass)

General: This community represented the non-degraded equivalent of p.c. 21 with six additional species, including four grasses. It occurred at an elevation of 1,981 m and occupied a niche along riparian terraces.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Christainburg series (table 3).

The community was supported by this Entisol series only; but this series did not support this community only. The Christainburg series exceeded 152 cm in depth, with a clay textured A1-horizon of less than 25 cm deep (Appendix A, fig. A4). Surface litter was 8.7%, and bare soil averaged 85.3% (table 27).
Vegetation: Save dominated cover by accounting for 55.9% of the total, and essentially shared the IV total with Sihy and Agsm with 33.5%, 32.5%, and 27.2%, respectively (table 27). Save, Sihy, and Agsm accounted for 90% or more of the four variables. Also, these three species had an IV $\geqq$ 0.8; the next highest species, Chna, had an IV of 0.07. The diversity of this community was somewhat low, 1.09, because the three dominant species accounted for 96.2% of the total density.
Ecological Stage: Mid-high seral.
PNV: Existing community with increased Spai.

Shrubland Formation...*Ceratoides* Subformation ...*C. lanata* Series

The two communities classified within the *Ceratoides* subformation consisted of sites which had Cela dominating the shrub synusia with an IV $\geqq$ 0.1 and at least one grass species as a dominant understory synusia (fig. 11). The series occurred on two soil orders, one complex, and three landforms. The series was minor in areal extent, but represented an important study area component.

23. *Ceratoides lanata - Gutierrezia sarothrae/Hilaria jamesii* p.c.

(Cela-Gusa/Hija; winterfat-snakeweed/galleta)

General: This is a degraded winterfat community evidenced by the status of Gusa and high percentage of bare soil. It differs from p.c. 24 primarily by the change in dominant grass species. Sample sites occurred between 1,737 m and 2,042 m in elevation.
Landform: Alluvial flats.
Soils: Ustic/Lithic Torriorthent, Shingle-Travessilla series (Assoc. A1);
Typic Torrifluvent, Billings series;
Ustollic Camborthid, Las Lucas-Unnamed 7B series (Assoc. A6);
Rock outcrop-Gypsum (Complex C3) (table 3).

Sample sites occurred on series within both Entisol and Aridisol orders, and on an azonal complex. Association A1 was less than 38 cm deep; the other soils were generally greater than 127 cm in depth; all were loamy (Appendix A, figs. A1, A3, A5, and A8). Sites were not specific to a particular soil series, indicating a wide ecological species amplitude. Bare soil, litter, and rock

Figure 11.—Representative photo of the *Ceratoides* subformation. Pictured is the *Ceratoides lanata - Gutierrezia sarothrae/Hilaria jamesii* plant community (p.c. 23).

averaged 89.7%, 3.0%, and 0.2%, respectively (table 28).
Vegetation: Hija dominated and accounted for 38.3%, 31.9%, 56.4%, and 23.8% of the total IV, cover, density, and frequency, respectively (table 28). Gusa was ranked second and Cela third for most variables. Of the 36 species, 7 contributed greater than 80% to the totals for IV, cover, and density. Sihy, Bogr, and Orhy were consistent components in minor amounts.
Ecological Stage: Mid-high seral, but degraded.
PNV: Existing community with decreased Gusa and increased Cela, Spai, and Orhy.

24. *Ceratoides lanata - Gutierrezia sarothrae/Bouteloua gracilis* p.c.

(Cela-Gusa/Bogr; winterfat-snakeweed/blue grama)

General: This community represented a degraded winterfat-alkali sacaton shrubland. The primary difference between this community and p.c. 23 is the dominance of Bogr rather than Hija. It may be conceivable to merge p.c. 23 and p.c. 24 if the separation between Bogr and Hija is not considered significant. Sample sites occurred at elevations between 1,844 m and 1,957 m.
Landform: Alluvial flats and mesas.
Soils: Lithic/Typic Torriorthent, Travessilla-Persayo series (Assoc.A2);
Ustic/Lithic Torriorthent, Shingle-Travesilla series (Assoc.A1);
Ustollic Camborthid, Las Lucas-Unnamed 7B series (Assoc.A6) (table 3).

One sample site occurred in each association; two were on the Entisol series. Effective soil depths within A1- and A2-horizons were less than 38 cm, with silty to clay loam textures (Appendix A, figs. A1 and A5). The Aridisol association (A6) was 102 cm or greater in depth with loamy textures. A1-horizons were less than 13 cm in depth with an 8.2 pH. Litter, rock, and bare soil averaged 3.5%, 0%, and 84.5%, respectively (table 29).
Vegetation: Bogr dominated the IV, cover, and density

values by contributing 46.7%, 52.3%, and 66.6% of the totals, respectively; Hija ranked second and was co-dominant with Bogr for frequency (table 29). Gusa and Cela were ranked third and fourth, respectively for all variables. The four top-ranked species accounted for more than 80% of the totals for IV, cover, and density. Spai, Orhy, and Spcr were constant community members, but with an IV < 0.1. Cela is a suffrutescent and therefore this community could be classified as p.c. 31 or p.c. 32 with a Cela synusia.
Ecological Stage: Mid-seral; degraded.
PNV: Existing community plus increased amounts of Cela, Spai, Orhy, Spcr and decreased Gusa.

Shrubland Formation...*Atriplex* Subformation ...*A. cuneata, A. obovata, A. canescens* Series

Six communities were classified within the *Atriplex* subformation consisting of sites which had Atcu (*Atriplex cuneata*), Atob (*A. obovata*), or Atca (*A. canescens*) dominating the shrub synusia with an IV $\geq$ 0.1 and at least one grass as an understory synusia. The series occurred on one soil order and two landforms. The series was a major study area component in both areal extent and niche occupation (fig. 12).

25. *Atriplex cuneata – Frankenia jamesii/Sporobolus airoides* p.c.

(Atcu-Frja/Spai; moundscale-Frankenia/alkali sacaton)

General: This is a minor community, but unique because of Atcu and Frja. The sample site occurred at 1,783 m on moderate slopes.
Landform: Colluvial slopes.
Soils: Ustic/Lithic Torriorthent, Shingle-Travessilla series (Assoc.A1) (table 3).

This Entisol association consisting of two series was shallow and eroded; soil depth was less than 51 cm (Appendix A, fig. A1). Texture was fine-sandy-loam to silty-clay-loam. Bare soil was 90% and rock was nearly 5%; surface litter was 0% (table 30).
Vegetation: Spai dominated the totals of IV, density, and frequency with values of 34.4%, 48.7%, and 33.3%, respectively (table 30). Frja and Atcu were ranked first and second for cover, with 28.4% and 31.6% of the total, respectively. Cela occurred in 40% of the plots and was ranked second in frequency, accounting for 14.8% of the total. Of the 13 species, 8 contributed 85% or more to the variable totals.
Ecological Stage: Mid-seral; degraded.
PNV: Current community with sustained amounts of Spai and increased Cela.

Figure 12.—Representative photo of the *Atriplex* subformation. Pictured is the *Atriplex canescens/Sporobolus airoides-Sitanion hystrix* plant community (p.c. 29).

26. *Atriplex obovata/Sporobolus airoides – S. cryptandrus* p.c.

(Atob/Spai-Spcr; ovate saltbush/alkali sacaton-sand dropseed)

General: This was a minor community, but unique because of Atob. It differed from p.c. 27 because of the dominance of Atob and very low diversity. One of the sites representing this community was Atob monospecific; but size restricted intensive sampling and a separate community. Sample site elevation was 1,829 m.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Christainburg series; Alluvial (table 3).

Most of this community occurred on an Entisol series, which had an effective soil depth of less than 25 cm with a clay texture (Appendix A, figs. A4 and A7). The Alluvial land was loamy textured to a depth of 25 cm, with a stratified subsurface of greater than 178 cm. Bare soil was 90% and litter was 5.2% (table 31).
Vegetation: Atob dominated the totals of IV, cover, and frequency with values of 58.7%, 71.2%, and 53.6%, respectively (table 31). Spai dominated the density total with 54.2%, and ranked second for the other three variables. The diversity of this community was only 0.24; three of the eight species accounted for 93% or greater of the variable totals.
Ecological Stage: Mid-high seral, degraded.
PNV: Existing community.

27. *Atriplex obovata – Gutierrezia sarothrae/Hilaria jamesii-Sporobolus airoides* p.c.

(Atob-Gusa/Hija-Spai; ovate saltbush-snakeweed/galleta-alkali sacaton)

General: This is a somewhat minor community, similar to p.c. 26 without the major dominance of Atob, and more degraded by the presence of Gusa. The sites for this community occurred at an elevation of 1,811 m.
Landform: Alluvial flats.
Soils: Ustic/Lithic Torriorthent, Shingle-Travessilla series (Assoc.A1) (table 3).

The Entisol association on which this community occurred was the same as for p.c. 26. The soils were

shallow, with an effective depth of less than 51 cm. Textures were fine-sandy-loam to silty-clay-loam (Appendix A, fig. A1). Litter was less than 3%, and bare soil was almost 91%; rock was insignificant (table 32).
Vegetation: Hija dominated the totals of IV, cover, density, and frequency with values of 43.1%, 34.9%, 64.5%, and 30.7%, respectively (table 32). Spai was ranked second and Atob third for all variables. Gusa accounted for 11.4%, 10.4%, 5%, and 18.8% of the totals for IV, cover, density, and frequency, respectively. The contribution of Gusa was not major; but, given the amount of bare soil and sparseness of associated species, Gusa has the potential to influence niche-space and reduce production. Of the 14 species, 5 accounted for 90% or more of the variable totals. Average plant density was only 14.4 plants/0.5 m^2.
Ecological Stage: Mid-high seral; degraded.
PNV: Existing vegetation with increased Spcr and Cela; decreased Gusa and OPUN species (*Optunia* spp.).

28. *Atriplex canescens/Hilaria jamesii* p.c.

(Atca/Hija; fourwing saltbush/galleta)

General: This community was represented by only one site, which was confounded, but which represented a unique floristic aspect. Atca dominated cover, and Hija dominated density. The site occurred at an elevation of 1,722 m. This community could be combined with p.c. 29.
Landform: Alluvial flats.
Soils: Ustic Torripsament/Torrifluvent, Sheppard-Unnamed 13 series; (Assoc. A9) (table 3).
This Entisol association had an A-horizon depth of less than 13 cm and a total pedon depth of greater than 152 cm. Textures were silty-clay-loam and loamy-sand (Appendix A, fig. A3). Surface litter was 13.4%, and bare soil was 83.3%; rock was insignificant (table 33).
Vegetation: Atca and Hija essentially co-dominated the IV total value with 23.6% and 22.3%, respectively (table 33). However, Atca contributed 70.7% of total cover, and Hija contributed 43.7% of total density. Spai, Sihy, and Bogr were minor components of all variables accounting for 0% of the density and frequency variables, and IVs < 0.1.
Ecological Stage: Low seral.
PNV: Existing vegetation with increased Spne and Spai, and persistent Gusa.

29. *Atriplex canescens/Sporobolus airoides – Sitanion hystrix* p.c.

(Atca/Spai-Sihy; fourwing saltbush/alkali sacaton-bottlebrush squirrel tail)

General: This community was very common in the study area both in number of representative sites and area. The sites occurred at elevations between 1,524 m and 1,890 m. Atca and three species of *Sporobolus* were consistent; Atob and Chvi (*Chrysothamnus vicidiflorus*) occasionally were present.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Billings series;
Typic Torrifluvent, Christainburg series;
Ustic Torrifluvent, Kim series;
Alluvial (table 3).
Each of the sites within this community occurred on a different Entisol series and on azonal alluvial land. The A1-horizons were less than 13 cm deep and were loamy textured (Appendix A, figs. A3, A4, and A8). Total soil depth exceeded 152 cm, surface pH exceeded 8.2, and textures included a clay fraction. Bare soil and litter averaged 77% and 17%, respectively; rock was insignificant (table 34).
Vegetation: Spai dominated the totals for IV, density, and frequency with values of 31.6%, 50.6%, and 27.3%, respectively (table 34). Atca dominated cover, with 54.6% of the total value, and ranked second for IV. Gusa had an IV > 0.1, but was a minor component, occuring in less than 10% of the plots. Of the 26 species, 6 accounted for nearly 80% or greater of the variable totals. Density of all species averaged 9 plants/0.5 m^2. Bogr was a very minor, inconsistent component.
Ecological Stage: High seral.
PNV: Existing community with increased *Sporobolus* species.

30. *Atriplex canescens – Gutierrezia sarothrae/Bouteloua gracilis-Sporobolus crytandrus* p.c.

(Atca-Gusa/Bogr-Spcr; fourwing saltbush-snakeweed/blue grama-sand dropseed)

General: This community is essentially a degraded component of p.c. 29, with dominant Gusa cover and frequency. Sample sites occurred at an elevation of 1,768 m.
Landform: Alluvial flats.
Soils: Ustic Torripsament/Torrifluvent, Sheppard-Unnamed 13 series (Assoc. A9) (table 3).
The Entisol series within this association exceeded 152 cm in depth, with A-horizons of less than 13 cm (Appendix A, fig. A3). Textures were loamy-sand and clay. Litter was less than 4%, and bare soil averaged 93.1% (table 35).
Vegetation: Gusa dominated the totals of IV and cover, with values of 21.5% and 34.5%, respectively (table 35). Bogr ranked second for IV and first for density. Spcr occurred in 45% of all plots and ranked first in frequency. Atca was ranked sixth for IV and second for cover, with 8.5% and 20.6% of the totals, respectively. Of the 19 species, 8 accounted for greater than 85% of the variable totals. Spai did not have an IV ≥ 0.1.
Ecological Stage: Low-mid seral; degraded.
PNV: Existing community with decreased Gusa and increased *Sporobolus* species.

Grassland Formation...*Bouteloua* Subformation ...*B. gracilis, B. eriopoda* Series

The five communities classified in the *Bouteloua* subformation consisted of sites which had Bogr or Boer

dominating the grass lifeform and a half-shrub synusia dominated by Gusa with an IV $\geqq$ 0.1 (fig. 13). The series occurred on all three soil orders, one soil complex, and three landforms. The subformation was a major and dominant component in the study area.

31. *Bouteloua gracilis – Hilaria jamesii* p.c.

(Bogr-Hija; blue grama-galleta)

General: This community is similar to p.c. 32 except it appears to be in a higher seral stage and less degraded because of the minor contribution of Gusa. Sample site elevation was 1,890 m.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Billings series (table 3).
This series in the Entisol order had an A1-horizon of less than 13 cm deep and a total pedon depth of nearly 178 cm (Appendix A, fig. A3). Horizon profiles were silty-clay-loam in texture, and ranged from 8.2 to 8.8 in pH. Bare soil was 66.8%, litter was 2.3%, and surface rock was zero (table 36).
Vegetation: The variables of IV, cover, density, and frequency were dominated by Bogr with values of 38.7%, 45.2%, 41.0%, and 30.8%, respectively (table 36). Hija ranked second for all variables, and Spcr and Spai were major contributors. Of the 13 species, 5 accounted for 90% or greater of the variable totals. Density averaged 25.7 plants/0.5 m^2, with a gama diversity of 1.33.
Ecological Stage: Mid-high seral.
PNV: Existing vegetation with increased Boer.

32. *Gutierrezia sarothrae/Bouteloua gracilis – Hilaria jamesii* p.c.

(Gusa/Bogr-Hija; snakeweed/blue grama-galleta)

General: The community was well represented within the study area. It was similar to p.c. 31 but degraded. The sample sites ranged between 1,859 m and 2,103 m elevation.

Figure 13.—Representative photo of the *Bouteloua* subformation. Pictured is the *Gutierrezia sarothrae/Bouteloua gracilis-Hilaria jamesii* plant community (p.c.32).

Landform: Mesas and alluvial flats.
Soils: Lithic/Typic Torriorthent, Shingle-Persayo series (Assoc. A2);
Typic Torrifluvent, Billings series;
Ustollic Camborthid, Las Lucas-Unnamed 7B (Assoc. A6);
Mollic/Lithic Haplargid, Penistaja-Bond series (Assoc. A8);
Basalt Outcrops-Orthents-Ustolls (Complex C1) (table 3).
This community occurred on several Entisol and Aridisol associations, and one complex. The series in A2 and A8 were shallow, with effective depths of about 51 cm (Appendix A, figs. A1, A3, A5, A6, and A8); textural class was loamy. The Billings series and Association A6 were greater than 89 cm in depth; A1-horizons were less than 13 cm deep; textural classes were loamy. Litter averaged 2.6%, bare soil was 83.7%, and rock was insignificant (table 37).
Vegetation: Bogr accounted for 49.1%, 52.9%, 71.2%, and 25.4% of the totals for IV, cover, density, and frequency, respectively (table 37). Hija and Gusa occurred in 79.6% and 44.4% of the plots, respectively. Of the 29 species, 4 contributed to 93.2% of the total density, which accounted for the low gama diversity of 0.95; mean density was 75.8 plants/0.5 m^2.
Ecological Stage: Mid-seral; degraded.
PNV: Existing community plus increased Spcr, Spai, Orhy, Cela, and Agsm with decreased amounts of Gusa.

33. *Gutierrezia sarothrae/Bouteloua gracilis – B. eriopoda* p.c.

(Gusa/Bogr-Boer; snakeweed/blue grama-black grama)

General: This was a minor community, but representative of a higher seral stage, yet somewhat degraded. The sample site occurred at an elevation of 1,951 m.
Landform: Colluvial slope.
Soils: Rock outcrops-Orthents-Ustolls (Complex C1) (table 3).
This Entisol-Mollisol complex was stoney-clay loam, with a median depth of 51 cm (Appendix A, fig. A8). Bare soil averaged 48.7%, litter was less than 1%, and rock averaged 32.3% (table 38).
Vegetation: Of the 18 species, 5 accounted for 90% of the totals for IV, cover, and density (table 38). Bogr dominated all variables except frequency, and Boer accounted for 22.1%, 25.2%, 20.3%, and 20.7% of the totals for IV, cover, density, and frequency, respectively. Hija and Gusa essentially ranked third and fourth, respectively, for all variables; Gusa occurred in 40% of the plots.
Ecological Stage: Mid-high seral; degraded.
PNV: Existing community with increased Boer, Stne (*Stipa neomexicana*), and Cela, and decreased Gusa and Hija.

34. *Bouteloua gracilis – Sporobolus airoides* p.c.

(Bogr-Spai; blue grama-alkali sacaton)

General: This is somewhat of an artificial community because of its conversion from PJ and seeding with

several *Agropyron* species. However, it is included as a distinct community because of its uniqueness and PNV. The sample site was at 2,240 m.
Landform: Mesa.
Soils: Typic Torriorthent, Persayo series (table 3).

This Entisol series had an effective soil depth of less than 25 cm and a total pedon depth of 152 cm (Appendix A, fig. A1). Texture of the A1-horizon was loam with an 8.2 pH. Bare soil accounted for 57.6%, rock was less than 1%, and litter averaged 19.2% (table 39).
Vegetation: Bogr ranked number one for IV, and density accounted for 20.0% and 27.9% of the variable totals, respectively (table 39). Spai ranked second for IV and first for cover. Two seeded species, Agde (*Agropyron desertorum*) and Agin (*Agropyron intermedium*), had an IV $\geqq$ 0.1. Of the 25 species, 8 accounted for about 80% of the variable totals, and contributed to 88.8% of the density total, accounting for an alpha diversity of 2.15.
Ecological Stage: Mid-seral.
PNV: Current community with increased amounts of Spcr, Agsm, Orhy, Jumo, and Pied.

35. *Gutierrezia sarothrae/Bouteloua eriopoda – Hilaria jamesii* p.c.

(Gusa/Boer-Hija; snakeweed/blue grama-black grama)

General: This was a somewhat degraded, high seral community based on the contribution of Gusa and Boer, respectively. The sample sites occurred between 1,737 m and 1,829 m in elevation. The community was a major floristic representative within the study area, but minor in areal extent.
Landform: Mesas.
Soils: Ustic Torriorthent, Kim series;
Basalt outcrops-Orthents-Ustolls (Complex C1) (table 3).

Each of the sample sites within this community occurred on a different soil—an Entisol and an Entisol-Mollisol complex. The Kim series had an A1-horizon less than 13 cm deep with a loamy texture. The C-horizons were clay-loam with a total pedon depth of 165 cm; pH varied between 8.2 and 8.8 (Appendix A, figs. A3 and A8). Bare soil averaged 70.7%, rock 12.5%, and litter 4.5% (table 40).
Vegetation: Boer dominated the variable totals of IV, cover, and frequency with 27.5%, 24.4%, and 23.6%, respectively (table 40). Hija ranked first for density, and Gusa essentially ranked third for all variables. Of the 23 species, 9 accounted for 85% or greater of all variables except frequency. Spcr and Atca had an IV > 0.1 and were constant but minor components.
Ecological Stage: High-seral; moderately degraded.
PNV: Existing community with increased Stne and Spcr; decreased Gusa.

Grassland Formation...*Hilaria* Subformation ...*H. jamesii* Series

The three communities classified in the *Hilaria* subformation consisted of sites which had Hija dominating the grass lifeform and/or Gusa dominating the shrub synusia with an IV $\geqq$ 0.1 and a co-dominant grass species (fig. 14). The communities occurred on three soil orders and two landforms. Hija communities were a major and dominant component of the study area in both areal extent and niche occupation.

Figure 14. —Representative photo of the *Hilaria* subformation. Pictured is the *Hilaria jamesii - Sporobolus airoides* plant community (p.c.37).

36. *Gutierrezia sarothrae/Hilaria jamesii – Bouteloua gracilis* p.c.

(Gusa/Hija-Bogr; snakeweed/galleta-blue grama)

General: This was a well-represented community within the study area. It was degraded and represented a major portion of the grassland formation. Sample sites occurred between 1,829 m and 2,073 m in elevation. The community differed from p.c. 32 by the dominance reversal of Bogr and Hija.
Landform: Colluvial slopes and alluvial flats.
Soils: Lithic/Typic Torriorthent, Travessilla-Persayo series (Assoc.A2);
Typic Torrifluvent, Billings series;
Ustollic Camborthid, Las Lucas-Unnamed 7B series (Assoc. A6);
Mollic/Lithic Haplargid, Penistaja-Bond series (Assoc. A8);
Lithic Argiustoll, Cabezon series (table 3).

This community occurred on Entisol, Aridisol, and Mollisol series within three associations and two single series. Association A2, A8 and the Cabezon series were shallow, with an effective soil depth of 51 cm or less (Appendix A, figs. A1, A3, A5, and A7). The Billings series and association A6 were deeper, with soils 76 cm or more in depth; most textures were fine-loamy to fine-silty. Surface litter averaged 5.7%, rock 4.7%, and bare soil 79.2% (table 41).
Vegetation: Hija dominated the variable totals of IV, cover, density, and frequency with 40.2%, 36.2%, 46.9%, and 32.9%, respectively (table 41). Bogr and Gusa ranked second and third, respectively for all variables. Of the

35 species, 5 accounted for 80% or more of the totals for IV, cover, and density. The same five species with an IV $\geqq$ 0.1, accounted for 92.2% of total density, which accounted for a relatively low diversity index of 1.26.
Ecological Stage: Mid-seral; degraded.
PNV: Current community with decreased Gusa and increased Spai, Spcr, Orhy, and Cela.

37. *Hilaria jamesii – Sporobolus airoides* p.c.

(Hija-Spai; galleta-alkali sacaton)

General: This community differs from p.c. 41 primarily in the dominance reversal of Hija and Spai; p.c. 37 represented the degraded phase. The community was well-represented within the study area on alluvial flats. Sample sites occurred between 1,738 m and 2,073 m.
Landform: Alluvial flats.
Soils: Ustic Torripsament, Sheppard-Unnamed 13 series (Assoc. A9);
Typic Torrifluvent, Christainburg series;
Ustic Torriorthent, Kim series;
Ustollic Camborthid, Las Lucas-Unnamed 7B series (Assoc. A6);
Mollic Camborthid, Litle series (table 3).

Each of the five sample sites within this community occurred on a different Entisol or Aridisol series or association, reflecting a wide species ecological amplitude and/or the broad scale of soil mapping. This was the only community which occurred on the Litle soil series. All of the soils exceeded 76 cm in depth and were fine-loamy textured (Appendix A, figs. A3–A6). Bare soil averaged 83.3%, surface litter 3.3%, and surface rock was insignificant (table 42).
Vegetation: Hija dominated the variable totals of IV, cover density, and frequency with 54.0%, 56.0%, 71.4%, and 42.6%, respectively (table 42). Spai ranked second for all variables.
Ecological Stage: Mid-high seral.
PNV: Current community with increased Spcr, Orhy, and Cela.

38. *Gutierrezia sarothrae/Hilaria jamesii – Sporobolus cryptandrus* p.c.

(Gusa/Hija-Spcr; snakeweed/galleta-sand dropseed)

General: This minor community was considered the degraded phase of p.c. 37 because of Gusa and several minor components. The community was not well-represented within the study area. The sample site occurred at 1,890 m. The co-dominance of Spcr was unique.
Landform: Alluvial flats.
Soils: Ustollic Cambortid, Las Lucas-Unnamed 7B series (Assoc. A6) (table 3).

This Aridisol association consisted of two series which had pedon depths of 76 cm or greater (Appendix A, fig. A5). Horizon textures ranged from loamy, silty-clay-loam, to silty-loam. A1-horizon depths were less than 13 cm, and B-horizons were about 25 cm in depth. Litter, rock, and bare soil averaged 5.2%, 0%, and 88.5%, respectively (table 43).
Vegetation: Hija dominated the variable totals of IV, density, and frequency with values of 36.0%, 49.6%, and 29.8%, respectively (table 43). Gusa ranked second for IV and first for cover, with 36.7% of the total. Spcr ranked third for IV and second for frequency. Of the 11 species, 5 accounted for 90% or more of the variable totals.
Ecological Stage: Mid-seral; degraded.
PNV: Existing community with increased Spai, Orhy, and Agsm; decreased Gusa.

Grassland Formation...*Sporobolus* Subformation ...*S. airoides, S. nealleyi* Series

The six communities classified in the *Sporobolus* subformation consisted of sites which had Spai, Spne and/or Gusa dominating the grass or shrub synusea with an IV $\geqq$ 0.1 and usually a second grass species as a co-dominant (fig. 15). These series occurred on two soil orders, two complexes, an azonal alluvial soil, and two landforms. This subformation was extremely important and occupied large areal expanses in the study area.

39. *Sporobolus airoides* p.c.

(Spai; alkali sacaton)

General: This community was monospecific and abstracted from only one site, but was representative of a high-seral stage within the study area. The sample site occurred at 1,798 m elevation.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Billings series (table 3).

This Entisol series was a deep, silty-clay-loam series. The A1-horizon was less than 13 cm deep, and the total pedon was greater than 152 cm; pH was generally 8.8 throughout the profile (Appendix A, fig. A1). Within this community, bare soil averaged 83.0%, surface litter was 2.2%, and rock was zero (table 44).
Vegetation: Spai dominated all four variables, accounting for 90% or greater of the totals (table 44). Bogr, Hija, and Atca were very minor components. Because Spai contributed 96.3% of the total density, the alpha diversity index was only 0.19.
Ecological Stage: High-seral.
PNV: Existing community.

40. *Sporobolus airoides – Bouteloua gracilis* p.c.

(Spai-Bogr; alkali sacaton-blue grama)

General: This community represented a common entity of the alluvial flats within the study area. The major difference between this community and p.c. 41, 42, and 43 was the co-dominant grass species and/or seral stage.

If Spai is the major dominant species of interest, p.c. 40, 41, and 43 could be combined. Sample sites occurred at elevations between 1,829 m and 1,890 m.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Billings series;
Typic Torrifluvent, Christainburg series;
Rock outcrops-Gypsum (Complex C3) (table 3).

The two Entisol series supporting this community had A1-horizons less than 13 cm and total pedon depths of 152 cm or greater (Appendix A, figs. A3, A4, and A8). Textures ranged from silty-clay-loam to clay and surface horizon pH averaged 8.7. Bare soil for this community average 71.9%, surface litter was 5.1%, and rock was insignificant (table 45).
Vegetation: Spai dominated the totals of IV, cover, density, and frequency with 43.4%, 59.5%, 38.7%, and 36.4%, respectively (table 45). Bogr ranked second for all variables. Of the 23 species, 4 accounted for 80% or greater of the variable totals. Spcr and Hija had IV's greater than 0.1, but were not totally constant.
Ecological Stage: High-seral.
PNV: Current community.

41. *Sporobolus airoides – Hilaria jamesii* p.c.

(Spai-Hija; alkali sacaton-galleta)

General: This community was similar to p.c. 40 and p.c. 43, except for the switch in co-dominance. The community was a common representative within the study area and occurred between 1,859 m and 1,981 m elevation.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Christainburg series;
Ustollic Camborthid, Las Lucas-Unnamed 7B series (Assoc. A6);
Alluvial land (table 3).

The Entisol and Aridisol series which supported this community were relatively deep, especially Christainburg which exceeded 152 cm; alluvial land exceeded 178 cm in depth (Appendix A, figs. A4, A5, and A8). The three series had A1-horizons less than 13 cm deep. Textures ranged from clay to silty-loam. Surface litter averaged 8.0%, rock 0%, and bare soil 68.2% (table 46).
Vegetation: Spai dominated the variable totals of IV, cover, density, and frequency with values of 55.4%, 74.9%, 49.4%, and 40.8%, respectively; Hija ranked second for all variables (table 46). Three of the species accounted for greater than 80% of the variable totals, except for frequency.
Ecological Stage: Mid-high seral.
PNV: Existing community plus increased Agsm and Orhy.

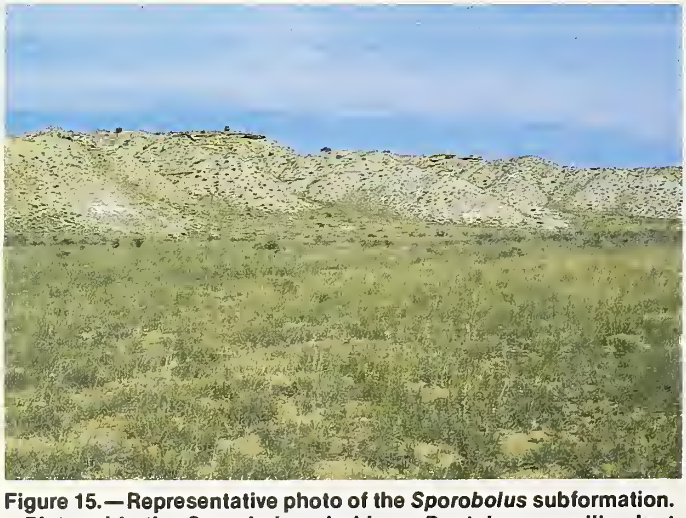

Figure 15.—Representative photo of the *Sporobolus* subformation. Pictured is the *Sporobolus airoides - Bouteloua gracilis* plant community (p.c.40).

42. *Gutierrezia sarothrae/Sporobolus airoides – Hilaria jamesii* p.c.

(Gusa/Spai-Hija; snakeweed/alkali sacaton-galleta)

General: This community represented the degraded phase of p.c. 41; it was not common within the study area. The sample sites occurred at an elevation of 1,859 m.
Landform: Mesas.
Soils: Ustic-Lithic Torriorthent, Shingle-Travessilla series (Assoc. A1);
Rock outcrops-Orthents (Complex C2) (table 3).

These Entisol soils were shallow, with effective depths of less than 51 cm and sandy/silty-clay-loam textures (Appendix A, figs. A1 and A8). Series pH ranged between 8.0 to 8.2, and A-horizons were less than 25 cm deep. Surface litter averaged 5.3%, surface rock 2.3%, and bare soil 87.6% (table 47).
Vegetation: Spai ranked first for total IV and cover, with values of 25.1% and 31.4%, respectively (table 47). Gusa ranked first for frequency, and occurred in 60% of the sample plots; Hija dominated cover with 33.2% of the total. Of the 22 species, 4 accounted for nearly 80% of all variable totals.
Ecological Stage: Mid-seral; degraded.
PNV: Current community with increased Boer, Orhy, and Cela; decreased Gusa.

43. *Sporobolus airoides – Agropyron smithii* p.c.

(Spai-Agsm; alkali sacaton-western wheatgrass)

General: This community was similar to p.c. 40 and p.c. 41, with the difference being the co-dominance of grass species. This community was not well-represented within the study area. The sample sites occurred between 1,890 m and 2,012 m.
Landform: Alluvial flats.
Soils: Typic Torrifluvent, Christainburg series (table 3).

This Entisol series was a deep, clay textured soil. The A1- and A/C-horizons were less than 13 cm deep; pH was 8.6 (Appendix A, fig. A4). The surface litter averaged 8.0% and bare soil was 64.9% (table 48).
Vegetation: Spai dominated the totals of IV, cover, density, and frequency with values of 44.7%, 64.6%, 25.2%, and 31.2%, respectively. Agsm was ranked second for

all variables (table 48). Spcr and Hija had an IV $\geq$ 0.1, but were minor, although constant components. Of the 20 species, 6 accounted for nearly 80% or more of the variable totals.
Ecological Stage: Mid-high seral.
PNV: Current community.

44. *Sporobolus nealleyi* – *Bouteloua eriopoda* p.c.

(Spne-Boer; gypgrass-black grama)

General: This was a minor, but unique community. It was considered high seral and restricted to gypsum soils. The sample site occurred at 1,737 m elevation.
Landform: Mesas.
Soils: Rock outcrops-Gypsum (Complex C3) (table 3).

This soil complex was shallow and contained a significant gypsum fraction (Appendix A, fig. A8). The rock outcrops were sandstone and shale. Surface litter averaged 2.5%, and bare soil was 88.8% (table 49).
Vegetation: Spne was ranked first for IV, density, and frequency accounting for 25.9%, 27.4%, and 20.0% of the totals, respectively (table 49). Boer ranked third for all variables, and *Leptodactylon* species (LEPT) ranked second, but was not included in the community name. Of the 16 species, 6 accounted for greater than 85% of the totals for all variables except frequency.
Ecological Stage: High seral.
PNV: Existing community with increased Cela and decreased LEPT species

Grassland Formation...*Scleropogon* Subformation ...*S. brevifolius* Series

This subformation consisted of only one minor, yet unique community dominated by *Scleropogon* (fig. 16).

45. *Scleropogon brevifolius* – *Bouteloua gracilis* p.c.

(Scbr-Bogr; burrograss-blue grama)

General: This was a unique, but minor community which was very restricted in areal extent. The sample site was located at 1,737 m.
Landform: Alluvial flat.
Soils: Ustic Torriorthent, Kim series (table 3).

This Entisol series had a total depth of greater than 165 cm and a shallow, loamy A1-horizon; most of the horizons were clay-loam (Appendix A, fig. A3). Surface litter averaged 1.1%, and bare soil was 84.2% (table 50).
Vegetation: Scbr dominated the variable totals of IV, cover, and density, with values of 34.6%, 39.5%, and 39.0%, respectively (table 50). Bogr ranked second for all variables; and Scbr, Bogr, and Spcr all ranked equally for frequency with 25.4% of the total. Of the 13 species, 5 accounted for greater than 90% of the variable totals.
Ecological Stage: Low seral.
PNV: Existing community with decreased Scbr.

Figure 16.—Representative photo of the *Scleropogon* subformation. Pictured is the *Scleropogon brevifolius* - *Bouteloua gracilis* plant community (p.c.45).

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Table 6.—Vegetation and soil surface characteristics for plant community 1 (p.c.1).

COMMUNITY 1 : Pipo/CARE-Bogr

SITES 80 101 102

No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[2]	D[1]	d[1]	SR[1]
3	11	33.1	26.4	3.3	3.4	21.7	0.7	74.2	11.9	2.03	34

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
PIPO	3	.587 - .699	.651	(21.7)		16.4 - 26.6	20.7	(62.5)		.0 - .1	.1	(.4)		2.0 - 10.0	5.0	(2.2)	
CARE	3	.413 - .536	.455	(15.2)		.3 - .5	.4	(1.2)		2.5 - 2.9	2.8	(23.1)		30.0 - 57.0	45.7	(19.7)	
HYRI	3	.357 - .606	.450	(15.0)		.5 - 1.3	1.0	(3.0)		.6 - 4.2	2.3	(19.3)		36.0 - 78.0	57.0	(24.6)	
POFE	2	0.000 - .578	.286	(9.5)		0.0 - .3	.2	(.6)		0.0 - 4.7	2.2	(18.8)		0.0 - 60.0	32.3	(14.0)	
BOGR	3	.231 - .297	.261	(8.7)		.5 - 1.0	.7	(2.2)		1.2 - 2.2	1.7	(14.3)		17.0 - 27.0	20.7	(8.9)	
PIED	3	.018 - .352	.150	(5.0)		.5 - 11.2	4.9	(14.9)		0.0 - .1	.0	(.4)		0.0 - 7.0	2.3	(1.0)	
BOHI	2	0.000 - .241	.137	(4.6)		0.0 - .4	.2	(.6)		0.0 - 2.1	1.2	(9.7)		0.0 - 20.0	13.3	(5.8)	
QUGA	3	.010 - .238	.121	(4.0)	83.7	.4 - 6.2	2.9	(8.8)	93.8	0.0 - .4	.2	(1.3)	87.3	0.0 - 13.0	5.7	(2.4)	78.6
ANCI	1		.078	(2.6)			.1	(.2)			.2	(1.8)			7.3	(3.2)	
HYME2	1		.076	(2.5)			.1	(.4)			.3	(2.9)			4.0	(1.7)	
THPI	1		.072	(2.4)			.2	(.7)			.2	(2.1)			4.7	(2.0)	
YUGL	3	.004 - .056	.029	(1.0)		0.0 - .6	.2	(.7)		0.0 - .1	.0	(.4)		0.0 - 7.0	3.7	(1.6)	
ERIO1	2	0.000 - .036	.021	(.7)		0.0 - .1	.0	(.1)		0.0 - .1	.1	(.5)		0.0 - 7.0	4.7	(2.0)	
AGSM	1		.021	(.7)			0.0	(0.0)			.1	(.6)			4.3	(1.9)	
ANTE	2	0.000 - .033	.019	(.6)		0.0 - 0.0	0.0	(0.0)		0.0 - .3	.2	(1.3)		0.0 - 3.0	2.0	(.9)	
JUOS	3	.004 - .045	.019	(.6)		.2 - 1.6	.7	(2.0)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
CEMO	1		.018	(.6)			.4	(1.3)			0.0	(0.0)			0.0	(0.0)	
ARLO1	1		.017	(.6)			0.0	(0.0)			.1	(.6)			1.3	(.6)	
SIHY	3	.015 - .019	.017	(.6)		.0 - .1	.1	(.2)		.0 - .0	.0	(.2)		2.0 - 3.0	2.7	(1.2)	
LUPI	1		.015	(.5)			0.0	(0.0)			.1	(.8)			2.3	(1.0)	
BLTR	1		.012	(.4)			.0	(.1)			.0	(.1)			1.3	(.6)	
ARAB	1		.011	(.4)			0.0	(0.0)			.0	(.2)			1.3	(.6)	
ARFR1	1		.010	(.3)			0.0	(0.0)			.0	(.3)			2.3	(1.0)	
SPHA	1		.007	(.2)			.0	(0.0)			.0	(.2)			.7	(.3)	
CHNA	1		.006	(.2)			0.0	(0.0)			.0	(.3)			1.0	(.4)	
SPCR	1		.005	(.2)			0.0	(0.0)			.0	(.1)			.7	(.3)	
KOCR	1		.005	(.2)			0.0	(0.0)			.0	(.1)			.7	(.3)	
GERA	2	0.000 - .014	.005	(.2)		0.0 - .0	.0	(0.0)		0.0 - .0	.0	(.1)		0.0 - 3.0	1.0	(.4)	
CAIN2	1		.005	(.2)			0.0	(0.0)			.0	(.1)			.7	(.3)	
SPCO	1		.005	(.2)			0.0	(0.0)			.0	(.1)			1.0	(.4)	
PSME	1		.005	(.2)			0.0	(0.0)			.0	(.1)			1.0	(.4)	
FEAR	1		.005	(.2)			0.0	(0.0)			.0	(.1)			1.0	(.4)	
JUMO	1		.003	(.1)			.1	(.3)			0.0	(0.0)			0.0	(0.0)	
FERU1	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				33.1				11.9						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 7.—Vegetation and soil surface characteristics for plant community 2 (p.c.2).

COMMUNITY 2: Pied·Pipo/Bogr·CARE

SITES 36

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	3	25.2	16.7	3.0	5.5	24.6	0.3	69.6	14.4	1.80	23

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	1		.761	(25.8)			1.5	(5.8)			7.4	(51.2)			50.0	(18.9)	
CHVI2	1		.563	(19.1)			2.3	(9.0)			2.6	(17.6)			91.0	(34.3)	
PIED	1		.331	(11.2)			8.3	(33.1)			0.0	(0.0)			0.0	(0.0)	
PIPO	1		.278	(9.4)			7.0	(27.8)			0.0	(0.0)			0.0	(0.0)	
CARE	1		.252	(8.5)			.3	(1.2)			2.0	(13.8)			27.0	(10.2)	
LEER	1		.122	(4.1)			.1	(.3)			.6	(4.4)			20.0	(7.5)	
SPOR	1		.103	(3.5)	81.6		.3	(1.2)	78.4		.4	(2.8)	89.8		17.0	(6.4)	77.3
ARTR	1		.090	(3.0)			1.9	(7.6)			.0	(.2)			3.0	(1.1)	
THPI	1		.080	(2.7)			.0	(.1)			.8	(5.3)			7.0	(2.6)	
JUMO	1		.054	(1.8)			1.4	(5.4)			0.0	(0.0)			0.0	(0.0)	
POLO	1		.052	(1.8)			.1	(.3)			.2	(1.2)			10.0	(3.8)	
KOCR	1		.038	(1.3)			.2	(.8)			.1	(.5)			7.0	(2.6)	
ERIO1	1		.037	(1.3)			.6	(2.3)			.0	(.2)			3.0	(1.1)	
SEDU	1		.036	(1.2)			.1	(.4)			.1	(.7)			7.0	(2.6)	
OENO	1		.034	(1.2)			.0	(.1)			.1	(.7)			7.0	(2.6)	
OUGA	1		.033	(1.1)			.8	(3.3)			0.0	(0.0)			0.0	(0.0)	
ARAB	1		.030	(1.0)			0.0	(0.0)			.1	(.5)			7.0	(2.6)	
MACH	1		.017	(.6)			0.0	(0.0)			.1	(.5)			3.0	(1.1)	
MUHL	1		.015	(.5)			0.0	(0.0)			.0	(.2)			3.0	(1.1)	
GUSA	1		.015	(.5)			0.0	(0.0)			.0	(.2)			3.0	(1.1)	
ERLA	1		.011	(.4)			.3	(1.1)			0.0	(0.0)			0.0	(0.0)	
SENE	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
HIJA	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			2.954				25.2				14.5						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 8.—Vegetation and soil surface characteristics for plant community 3 (p.c.3).

COMMUNITY 3: Pied/Bogr·ERIO

SITES 20

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	2	8.6	2.3	0.5	5.8	1.6	22.6	70.0	5.6	1.95	16

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
ERLE	1		.720	(24.0)			3.3	(38.4)			.9	(15.2)			35.0	(18.4)	
ERJA	1		.585	(19.5)			.3	(3.5)			1.9	(33.9)			40.0	(21.1)	
BOGR	1		.314	(10.5)			.3	(2.9)			1.3	(23.2)			10.0	(5.3)	
PIED	1		.233	(7.8)			2.0	(23.3)			0.0	(0.0)			0.0	(0.0)	
ERIO1	1		.167	(5.6)			.2	(1.7)			.3	(4.5)			20.0	(10.5)	
GUSA	1		.164	(5.5)			.5	(5.8)			.2	(2.7)			15.0	(7.9)	
HIJA	1		.147	(4.9)			.1	(.6)			.4	(6.3)			15.0	(7.9)	
ORHY	1		.120	(4.0)			.4	(4.1)			.2	(2.7)			10.0	(5.3)	
HYFI	1		.106	(3.5)	85.3		.2	(1.7)	82.0		.2	(3.6)	92.2		10.0	(5.3)	81.7
UNKF	1		.079	(2.6)			0.0	(0.0)			.2	(2.7)			10.0	(5.3)	
TOIN	1		.079	(2.6)			0.0	(0.0)			.2	(2.7)			10.0	(5.3)	
MUHL	1		.070	(2.3)			.6	(7.0)			0.0	(0.0)			0.0	(0.0)	
ARBI1	1		.058	(1.9)			.5	(5.8)			0.0	(0.0)			0.0	(0.0)	
MENT1	1		.053	(1.8)			.2	(1.7)			.1	(.9)			5.0	(2.6)	
YUGL	1		.035	(1.2)			0.0	(0.0)			.1	(.9)			5.0	(2.6)	
CRFU	1		.035	(1.2)			0.0	(0.0)			.1	(.9)			5.0	(2.6)	
JUMO	1		.029	(1.0)			.3	(2.9)			0.0	(0.0)			0.0	(0.0)	
MIMU	1		.006	(.2)			.1	(.6)			0.0	(0.0)			0.0	(0.0)	
			3.000				8.6				5.6						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 9.—Vegetation and soil surface characteristics for plant community 4 (p.c.4).

COMMUNITY 4 : Pied-Jumo/Oppo/Bogr

SITES 91

No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[2]	D[1]	d[1]	SR[1]
1	3	21.9	10.8	5.2	5.9	14.5	2.2	77.4	24.4	0.84	10

(C through SR are means.)

SPECIES[3]	K[4]	IMPORTANCE VALUE RANGE	MEAN	% TOTAL	TP[5]	PERCENT COVER RANGE	MEAN	% TOTAL	TP[5]	DENSITY RANGE	MEAN	% TOTAL	TP[5]	PERCENT FREQUENCY RANGE	MEAN	% TOTAL	TP[5]
BOGR	1		1.371	(45.7)			5.0	(23.0)			18.3	(75.1)			77.0	(38.5)	
OPPO	1		.650	(21.7)			3.2	(14.7)			4.0	(16.4)			67.0	(33.5)	
JUMO	1		.298	(9.9)			6.5	(29.8)			0.0	(0.0)			0.0	(0.0)	
PIED	1		.196	(6.5)			4.3	(19.6)			0.0	(0.0)			0.0	(0.0)	
GUSA	1		.158	(5.3)			.3	(1.2)			.7	(2.7)			24.0	(12.0)	
HIJA	1		.121	(4.0)	93.1		.5	(2.4)	90.9		.7	(2.9)	97.1		14.0	(7.0)	91.0
ARTR	1		.085	(2.8)			1.0	(4.7)			.1	(.4)			7.0	(3.5)	
SIHY	1		.067	(2.2)			.3	(1.2)			.5	(2.0)			7.0	(3.5)	
YUGL	1		.051	(1.7)			.7	(3.0)			.1	(.4)			4.0	(2.0)	
SELO	1		.003	(.1)			.1	(.3)			0.0	(0.0)			0.0	(0.0)	
			3.000				21.9				24.4						

[1] C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2] BS = 100 - (HC + L + R).
[3] Plant species symbol (see Appendix B for full nomenclature).
[4] K = Constancy.
[5] TP = Total percent for species with IV ≥ 0.1.

Table 10.—Vegetation and soil surface characteristics for plant community 5 (p.c.5).

COMMUNITY 5 : Pied/Quga/Hija-Spne

SITES 96

No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[2]	D[1]	d[1]	SR[1]
1	2	5.1	1.0	2.4	1.7	3.3	0	95.0	3.4	1.27	13

(C through SR are means.)

SPECIES[3]	K[4]	IMPORTANCE VALUE RANGE	MEAN	% TOTAL	TP[5]	PERCENT COVER RANGE	MEAN	% TOTAL	TP[5]	DENSITY RANGE	MEAN	% TOTAL	TP[5]	PERCENT FREQUENCY RANGE	MEAN	% TOTAL	TP[5]
HIJA	1		1.143	(38.1)			.6	(11.8)			2.0	(59.7)			45.0	(42.9)	
SPNE1	1		.411	(13.7)			.2	(2.9)			.8	(23.9)			15.0	(14.3)	
QUGA	1		.353	(11.8)			1.8	(35.3)			0.0	(0.0)			0.0	(0.0)	
PIED	1		.196	(6.5)			1.0	(19.6)			0.0	(0.0)			0.0	(0.0)	
HYFI	1		.151	(5.0)			.5	(8.8)			.1	(1.5)			5.0	(4.8)	
EPTO	1		.146	(4.9)			.4	(6.9)			.1	(3.0)			5.0	(4.8)	
CHGR	1		.140	(4.7)			0.0	(0.0)			.2	(4.5)			10.0	(9.5)	
GUSA	1		.118	(3.9)	88.6		.6	(11.8)	97.1		0.0	(0.0)	92.6		0.0	(0.0)	76.3
UNKF	1		.092	(3.1)			.2	(2.9)			.1	(1.5)			5.0	(4.8)	
ORHY	1		.063	(2.1)			0.0	(0.0)			.1	(1.5)			5.0	(4.8)	
MENT1	1		.063	(2.1)			0.0	(0.0)			.1	(1.5)			5.0	(4.8)	
CRJA	1		.063	(2.1)			0.0	(0.0)			.1	(1.5)			5.0	(4.8)	
ANCI	1		.063	(2.1)			0.0	(0.0)			.1	(1.5)			5.0	(4.8)	
			3.002				5.1				3.4						

[1] C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2] BS = 100 - (HC + L + R).
[3] Plant species symbol (see Appendix B for full nomenclature).
[4] K = Constancy.
[5] TP = Total percent for species with IV ≥ 0.1.

Table 11.—Vegetation and soil surface characteristics for plant community 6 (p.c.6).

COMMUNITY 6 : Jumo/Gusa/Bogr-Hija

SITES 103 104 106 108

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
4	18	13.9	3.1	2.4	8.4	12.5	18.6	60.5	22.7	1.98	50

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	4	.377 - .858	.552	(18.4)		.7 - 5.1	2.1	(15.2)		2.2 - 20.8	8.0	(35.2)		18.0 - 80.0	36.0	(14.0)	
HIJA	4	.234 - .618	.467	(15.5)		.6 - 1.4	1.0	(7.1)		2.5 - 5.3	4.2	(18.7)		32.0 - 53.0	39.3	(15.3)	
GUSA	4	.221 - .385	.328	(10.9)		.1 - 1.6	.9	(6.8)		.5 - .7	.6	(2.4)		32.0 - 37.0	33.8	(13.1)	
STNE	4	.037 - .498	.274	(9.1)		.0 - 4.2	1.5	(10.6)		.2 - 7.0	2.9	(12.6)		4.0 - 70.0	32.0	(12.5)	
ARLO1	4	.062 - .350	.201	(6.7)		.5 - 1.5	.9	(6.2)		.2 - 2.6	1.1	(5.0)		7.0 - 32.0	16.3	(6.3)	
JUMO	4	.127 - .247	.193	(6.4)		1.7 - 3.7	2.7	(19.2)		0.0 - .0	.0	(0.0)		0.0 - 3.0	.8	(.3)	
BOER1	2	0.000 - .261	.112	(3.7)	70.7	0.0 - 1.6	.5	(3.3)	68.4	0.0 - 4.4	1.3	(5.8)	79.7	0.0 - 43.0	13.3	(5.2)	66.7
BOCU	4	.034 - .180	.099	(3.3)		.2 - .6	.3	(2.4)		.0 - 2.2	1.0	(4.6)		2.0 - 18.0	7.3	(2.8)	
MUTH	3	0.000 - .123	.081	(2.7)		0.0 - .5	.2	(1.7)		0.0 - 3.2	1.1	(5.0)		0.0 - 10.0	5.5	(2.1)	
UNKF	2	0.000 - .300	.079	(2.6)		0.0 - 1.3	.3	(2.3)		0.0 - 1.3	.3	(1.4)		0.0 - 40.0	10.5	(4.1)	
OUGR	3	0.000 - .168	.066	(2.2)		0.0 - 1.4	.6	(4.0)		0.0 - .2	.1	(.2)		0.0 - 4.0	2.0	(.8)	
SPAI	2	0.000 - .177	.062	(2.1)		0.0 - .7	.2	(1.5)		0.0 - 1.2	.5	(2.1)		0.0 - 8.0	4.0	(1.6)	
HYRI	2	0.000 - .097	.045	(1.5)		0.0 - .5	.2	(1.2)		0.0 - .2	.1	(.4)		0.0 - 8.0	4.0	(1.6)	
ARBI	2	0.000 - .101	.035	(1.2)		0.0 - .9	.3	(2.0)		0.0 - .1	.0	(.1)		0.0 - 8.0	3.0	(1.2)	
OUGA	1		.034	(1.1)			.4	(2.6)			.0	(0.0)			1.0	(.4)	
OPPO	4	.003 - .078	.032	(1.1)		.0 - .2	.1	(.7)		0.0 - .2	.1	(.3)		0.0 - 13.0	5.3	(2.0)	
LUER	1		.028	(.9)			.0	(.1)			.1	(.6)			5.5	(2.1)	
ASTR	1		.027	(.9)			.1	(.7)			.3	(1.4)			7.5	(2.9)	
PIED	4	.017 - .041	.026	(.9)		.2 - .8	.4	(2.8)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
SIHY	4	.010 - .051	.025	(.8)		0.0 - .1	.0	(.2)		.0 - .6	.2	(.8)		2.0 - 17.0	6.3	(2.4)	
CEMO	1		.024	(.8)			.2	(1.8)			0.0	(0.0)			0.0	(0.0)	
ARTR	3	0.000 - .039	.023	(.7)		0.0 - .4	.1	(1.0)		0.0 - .1	.0	(.1)		0.0 - 4.0	2.0	(.8)	
LEER	2	0.000 - .064	.020	(.7)		0.0 - .1	.0	(.3)		0.0 - .8	.2	(.9)		0.0 - 20.0	5.5	(2.1)	
ERIO1	1		.019	(.6)			.0	(.1)			.0	(.2)			3.0	(1.2)	
SPCR	4	.003 - .024	.018	(.6)		.0 - .1	.1	(.4)		0.0 - .1	.1	(.3)		0.0 - 7.0	3.3	(1.3)	
CHVI2	1		.015	(.5)			.1	(.6)			.0	(0.0)			1.0	(.4)	
RHTR	1		.014	(.5)			.1	(.8)			.0	(0.0)			.5	(.2)	
CRYP	1		.013	(.4)			.2	(1.2)			0.0	(0.0)			0.0	(0.0)	
MELE	1		.013	(.4)			.1	(.4)			.0	(.1)			1.0	(.4)	
AGAL	1		.012	(.4)			.0	(.1)			.2	(.7)			1.0	(.4)	
DAFO	1		.009	(.3)			.1	(.4)			.0	(0.0)			.5	(.2)	
OPER	1		.008	(.3)			.1	(.5)			.0	(0.0)			.5	(.2)	
YUCC	1		.006	(.2)			.0	(0.0)			.0	(0.0)			1.0	(.4)	
CARE	1		.005	(.2)			0.0	(0.0)			.0	(.2)			.5	(.2)	
ANSC	2	0.000 - .013	.005	(.2)		0.0 - .2	.1	(.4)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
SEMO	1		.004	(.1)			.0	(.3)			0.0	(0.0)			0.0	(0.0)	
ATCA	1		.004	(.1)			.1	(.6)			0.0	(0.0)			0.0	(0.0)	
AGSM	1		.004	(.1)			0.0	(0.0)			.0	(.1)			.5	(.2)	
ASME	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
ARTE	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
ORHY	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
MURI1	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
EULA	1		.003	(.1)			0.0	(0.0)			.1	(.3)			.8	(.3)	
OPIM	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
MUPU	1		.002	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
STEP	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
EPTO	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
SPCO	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
OPCL	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
LERE	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				13.9				22.7						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.

[2]BS = 100 - (HC + L + R).

[3]Plant species symbol (see Appendix B for full nomenclature).

[4]K = Constancy.

[5]TP = Total percent for species with IV ≥ 0.1.

Table 12.—Vegetation and soil surface characteristics for plant community 7 (p.c.7).

COMMUNITY 7 : Jumo/Bogr

SITES 40 51 85 90

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
4	16	13.3	5.7	0.9	6.7	7.9	11.4	74.0	31.3	1.31	44

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	4	.512 - 1.560	1.059	(35.3)		.6 - 6.1	3.5	(26.0)		3.8 - 48.7	20.3	(65.0)		18.0 - 85.0	55.3	(24.7)	
HIJA	4	.090 - .922	.504	(16.8)		.2 - 5.4	1.7	(12.9)		.3 - 12.9	5.7	(18.2)		10.0 - 73.0	46.3	(20.7)	
JUMO	4	.249 - .638	.405	(13.5)		1.7 - 9.6	5.4	(40.3)		0.0 - .0	.0	(0.0)		0.0 - 3.0	.8	(.3)	
GUSA	4	.134 - .422	.237	(7.9)		.4 - .9	.6	(4.8)		.3 - .8	.6	(2.0)		15.0 - 50.0	33.3	(14.9)	
SPCR	4	.014 - .393	.137	(4.6)	78.1	0.0 - .3	.1	(.6)	84.8	.1 - 2.2	.9	(2.9)	88.1	2.0 - 28.0	15.0	(6.7)	67.3
MUTO	3	0.000 - .159	.057	(1.9)		0.0 - .3	.1	(.9)		0.0 - 3.3	.9	(2.9)		0.0 - 23.0	7.5	(3.4)	
ARFI	1		.047	(1.6)			.5	(4.0)			.0	(.1)			2.0	(.9)	
BOER	2	0.000 - .157	.042	(1.4)		0.0 - .2	.1	(.5)		0.0 - 4.1	1.1	(3.4)		0.0 - 10.0	3.3	(1.5)	
BOER1	1		.042	(1.4)			.0	(.2)			.3	(.9)			2.0	(.9)	
PEPU	1		.040	(1.3)			.1	(.9)			.1	(.2)			4.5	(2.0)	
SIHY	3	0.000 - .096	.039	(1.3)		0.0 - .1	.0	(.2)		0.0 - .6	.2	(.7)		0.0 - 10.0	5.8	(2.6)	
OPPO	2	0.000 - .121	.038	(1.3)		0.0 - .1	.0	(.3)		0.0 - .7	.2	(.7)		0.0 - 23.0	7.8	(3.5)	
ORHY	2	0.000 - .089	.031	(1.0)		0.0 - .1	.0	(.2)		0.0 - .2	.1	(.2)		0.0 - 13.0	5.0	(2.2)	
ARDI2	1		.024	(.8)			.0	(.2)			.1	(.4)			2.0	(.9)	
PIED	3	0.000 - .060	.023	(.8)		0.0 - .9	.3	(2.2)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
ARTR	1		.022	(.7)			.1	(.5)			.0	(0.0)			1.5	(.7)	
OPUN	1		.022	(.7)			.0	(.2)			.1	(.2)			2.0	(.9)	
SPHA	2	0.000 - .077	.020	(.7)		0.0 - .2	.0	(.3)		0.0 - .3	.1	(.2)		0.0 - 8.0	2.0	(.9)	
MUPU	1		.019	(.6)			.0	(.2)			.1	(.3)			1.3	(.6)	
DAFO	1		.019	(.6)			.0	(.1)			.1	(.2)			2.5	(1.1)	
ARIS	1		.019	(.6)			.0	(.1)			.1	(.2)			2.0	(.9)	
ARLO1	2	0.000 - .038	.017	(.6)		0.0 - .0	.0	(0.0)		0.0 - .1	.0	(.1)		0.0 - 8.0	3.3	(1.5)	
SELO	1		.016	(.5)			.0	(.1)			.1	(.2)			3.3	(1.5)	
ERIO1	2	0.000 - .052	.016	(.5)		0.0 - 0.0	0.0	(0.0)		0.0 - .1	.0	(.1)		0.0 - 8.0	2.5	(1.1)	
SPCO	1		.015	(.5)			.0	(.1)			.0	(.1)			2.0	(.9)	
ATCA	1		.012	(.4)			.2	(1.4)			0.0	(0.0)			0.0	(0.0)	
HASP2	1		.011	(.4)			.0	(.1)			.1	(.2)			2.5	(1.1)	
BOCU	1		.009	(.3)			0.0	(0.0)			.1	(.3)			1.8	(.8)	
RHTR	1		.008	(.3)			.1	(1.1)			0.0	(0.0)			0.0	(0.0)	
YUGL	1		.005	(.2)			.0	(.1)			.0	(0.0)			.8	(.3)	
EPTO	1		.005	(.2)			.0	(.1)			.0	(0.0)			.8	(.3)	
QUGA	1		.004	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
CERC1	1		.004	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
OROB	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
MIMU	1		.004	(.1)			.1	(.5)			0.0	(0.0)			0.0	(0.0)	
ASCL	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
ALLI	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
SENE	1		.003	(.1)			.1	(.4)			0.0	(0.0)			0.0	(0.0)	
PHYS	1		.003	(.1)			.0	(.3)			0.0	(0.0)			0.0	(0.0)	
MIRA	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
LYPA1	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
LESO	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
COVI	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
OPIM	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
			3.000				13.3				31.3						

[1]C = *Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*

[2]*BS = 100 - (HC + L + R).*

[3]*Plant species symbol (see Appendix B for full nomenclature).*

[4]*K = Constancy.*

[5]*TP = Total percent for species with IV ⩾ 0.1.*

Table 13.—Vegetation and soil surface characteristics for plant community 8 (p.c.8).

COMMUNITY 8 : Jumo/Artr/Hija-Spcr

SITES 30

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
1	3	18.0	3.8	7.8	6.4	19.7	1.5	72.4	25.2	1.33	15

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	1		.869	(29.0)			3.9	(21.7)			10.3	(40.8)			67.0	(24.5)	
SPCR	1		.741	(24.7)			.8	(4.6)			11.0	(43.8)			70.0	(25.5)	
ARTR	1		.390	(13.0)			5.7	(31.9)			.3	(1.1)			17.0	(6.2)	
GUSA	1		.242	(8.1)			1.8	(10.0)			.8	(3.2)			30.0	(10.9)	
JUMO	1		.209	(7.0)			3.8	(21.0)			0.0	(0.0)			0.0	(0.0)	
LEER	1		.172	(5.7)			.1	(.4)			1.2	(4.6)			34.0	(12.4)	
SIHY	1		.113	(3.8)	91.3		.2	(1.3)	91.1		.7	(2.7)	96.2		20.0	(7.3)	86.8
AGSM	1		.061	(2.0)			.0	(.2)			.3	(1.1)			13.0	(4.7)	
OPPO	1		.055	(1.8)			.3	(1.8)			.3	(1.2)			7.0	(2.6)	
ARLO1	1		.052	(1.7)			.3	(1.8)			.2	(.9)			7.0	(2.6)	
SPAI	1		.051	(1.7)			.6	(3.5)			.1	(.4)			3.0	(1.1)	
SPPA1	1		.014	(.5)			0.0	(0.0)			.0	(.1)			3.0	(1.1)	
SPCO2	1		.014	(.5)			0.0	(0.0)			.0	(.1)			3.0	(1.1)	
CRYP	1		.011	(.4)			.2	(1.1)			0.0	(0.0)			0.0	(0.0)	
ORHY	1		.007	(.2)			.1	(.7)			0.0	(0.0)			0.0	(0.0)	
			3.001				18.0				25.2						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 14.—Vegetation and soil surface characteristics for plant community 9 (p.c.9).

COMMUNITY 9 : Artr/Bogr-Hija

SITES 5 7 9 22 23 37 146

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
7	17	20.5	0	9.3	11.2	9.1	0	79.7	56.1	0.93	23

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	7	.770 - 2.202	1.412	(47.1)		3.7 - 16.8	8.8	(43.0)		15.7 - 118.8	43.0	(76.8)		70.0 - 100.0	85.1	(27.1)	
ARTR	7	.106 - 1.103	.697	(23.2)		.8 - 12.8	8.9	(43.5)		.3 - 4.9	1.9	(3.4)		15.0 - 97.0	66.4	(21.2)	
HIJA	6	0.000 - .821	.370	(12.3)		0.0 - 3.1	1.3	(6.4)		0.0 - 17.0	6.8	(12.1)		0.0 - 95.0	50.9	(16.2)	
SPCR	7	.017 - .207	.124	(4.1)	86.7	.0 - 1.3	.4	(2.1)	95.0	.0 - 2.2	1.1	(1.9)	94.2	3.0 - 40.0	24.1	(7.7)	72.2
GUSA	6	0.000 - .244	.088	(2.9)		0.0 - 1.2	.3	(1.4)		0.0 - 1.6	.5	(1.0)		0.0 - 50.0	20.3	(6.5)	
SIHY	7	.039 - .144	.087	(2.9)		0.0 - .5	.2	(.9)		.1 - 1.0	.6	(1.0)		10.0 - 30.0	19.3	(6.1)	
HASP2	3	0.000 - .272	.053	(1.8)		0.0 - .3	.1	(.4)		0.0 - 4.1	.7	(1.2)		0.0 - 53.0	11.3	(3.6)	
AGSM	3	0.000 - .168	.030	(1.0)		0.0 - .3	.1	(.3)		0.0 - 2.2	.4	(.7)		0.0 - 37.0	6.3	(2.0)	
OPPO	3	0.000 - .111	.021	(.7)		0.0 - 3	.0	(.2)		0.0 - .7	.1	(.2)		0.0 - 27.0	5.3	(1.7)	
SPHA	4	0.000 - .058	.018	(.6)		0.0 - 0.0	0.0	(0.0)		0.0 - .8	.1	(.2)		0.0 - 10.0	4.3	(1.4)	
MUTO	2	0.000 - .073	.018	(.6)		0.0 - .1	.0	(.1)		0.0 - .9	.2	(.3)		0.0 - 20.0	4.3	(1.4)	
SPAI	2	0.000 - .081	.018	(.6)		0.0 - .4	.1	(.5)		0.0 - 1.9	.3	(.5)		0.0 - 7.0	2.0	(.6)	
AGCR	1		.012	(.4)			.0	(.2)			.1	(.2)			2.9	(.9)	
ARLO1	2	0.000 - .051	.011	(.4)		0.0 - .4	.1	(.4)		0.0 - 1.0	.2	(.3)		0.0 - 3.0	.9	(.3)	
SPDI	1		.009	(.3)			0.0	(0.0)			.0	(.1)			2.9	(.9)	
STCO1	1		.008	(.3)			.1	(.4)			.0	(0.0)			1.4	(.5)	
COVI	2	0.000 - .035	.007	(.2)		0.0 - 0.0	0.0	(0.0)		0.0 - .3	.1	(.1)		0.0 - 10.0	1.9	(.6)	
CELA	2	0.000 - .034	.006	(.2)		0.0 - .3	.0	(.2)		0.0 - .1	.0	(0.0)		0.0 - 5.0	1.1	(.4)	
ARFE1	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.4	(.5)	
ERIO1	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
UNKF	1		.002	(.1)			.0	(0.0)			.0	(0.0)			.4	(.1)	
WCOMP	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
NDLLF	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
			3.000				20.5				56.1						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV > 0.1.

Table 15.—Vegetation and soil surface characteristics for plant community 10 (p.c.10).

COMMUNITY 10: Artr-Gusa/Bogr-Hija

SITES 1 4 152

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
3	9	19.4	0.1	7.7	11.6	10.5	0.1	77.8	56.0	1.38	30

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	3	.789 - 1.587	1.059	(35.3)		3.8 - 9.9	5.9	(30.5)		22.9 - 47.6	31.6	(56.4)		60.0 - 87.0	75.7	(18.9)	
HIJA	3	.437 - .813	.605	(20.2)		2.8 - 3.4	3.1	(16.3)		8.7 - 19.5	13.1	(23.4)		50.0 - 97.0	80.0	(20.0)	
ARTR	3	.342 - .537	.465	(15.5)		1.8 - 10.5	5.6	(28.7)		.5 - 1.6	.9	(1.7)		23.0 - 63.0	42.0	(10.5)	
GUSA	3	.118 - .314	.214	(7.1)		.8 - 2.3	1.7	(8.8)		.6 - 2.4	1.3	(2.4)		17.0 - 77.0	48.0	(12.0)	
SIHY	3	.071 - .235	.129	(4.3)		.2 - .5	.4	(2.2)		.3 - 4.1	1.6	(2.9)		13.0 - 63.0	33.0	(8.2)	
AGSM	3	.017 - .188	.126	(4.2)	86.6	.0 - .5	.2	(1.3)	87.8	.1 - 4.5	2.7	(4.8)	91.6	3.0 - 50.0	27.7	(6.9)	76.5
STNE	1		.087	(2.9)			.5	(2.8)			.8	(1.4)			23.3	(5.8)	
AGCR	1		.064	(2.1)			.6	(3.3)			.6	(1.1)			12.3	(3.1)	
LEER	1		.043	(1.4)			.2	(1.1)			1.1	(2.0)			5.7	(1.4)	
SPAI	2	0.000 - .076	.038	(1.3)		0.0 - .4	.1	(.7)		0.0 - 1.6	1.0	(1.8)		0.0 - 13.0	5.3	(1.3)	
ORHY	2	0.000 - .057	.033	(1.1)		0.0 - .4	.2	(1.0)		0.0 - .4	.2	(.4)		0.0 - 17.0	10.0	(2.5)	
EUPH	1		.030	(1.0)			.1	(.3)			.4	(.7)			10.0	(2.5)	
SPCR	3	.007 - .032	.019	(.6)		0.0 - .1	.0	(.1)		.0 - .3	.2	(.3)		3.0 - 7.0	5.7	(1.4)	
ATCA	1		.016	(.5)			.2	(1.2)			.0	(0.0)			2.3	(.6)	
CHNA	1		.015	(.5)			.2	(1.1)			.1	(.2)			1.0	(.2)	
PIED	2	0.000 - .015	.009	(.3)		0.0 - .3	.1	(.6)		0.0 - .1	.0	(0.0)		0.0 - 7.0	2.3	(.6)	
ATCO	1		.008	(.3)			0.0	(0.0)			.0	(.1)			3.3	(.8)	
ATOB	1		.007	(.2)			.0	(.2)			.0	(.1)			1.0	(.2)	
UKCOM	1		.003	(.1)			.0	(.1)			.0	(0.0)			1.0	(.2)	
TECA	1		.003	(.1)			.0	(.1)			.0	(0.0)			1.0	(.2)	
CELA	1		.003	(.1)			.0	(.1)			.0	(0.0)			1.0	(.2)	
SPDI	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
OROB	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
OPPO	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
MIMU	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
JUMO	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
HASP	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
CHPA	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
ASFL2	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
ASFL1	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.2)	
			2.999				19.4				56.0						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 16.—Vegetation and soil surface characteristics for plant community 11 (p.c.11).

COMMUNITY 11 : Artr/Bogr-Hija-Spai

SITES 16 87 92 94

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
4	15	17.4	0	4.6	12.8	5.4	0	81.8	57.3	1.19	26

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	4	.423 - 1.417	.903	(30.1)		2.9 - 7.4	5.0	(28.7)		7.3 - 48.2	24.6	(42.9)		25.0 - 86.0	53.0	(20.3)	
HIJA	4	.177 - 1.712	.817	(27.2)		.8 - 8.4	4.0	(22.8)		4.4 - 42.3	18.4	(32.1)		28.0 - 97.0	55.5	(21.3)	
SPAI	4	.482 - .650	.564	(18.8)		2.3 - 4.5	3.4	(19.4)		7.5 - 12.1	9.8	(17.1)		34.0 - 64.0	50.3	(19.3)	
ARTR	4	.250 - .558	.418	(13.9)	90.0	.7 - 7.9	4.3	(24.6)	95.5	.5 - 2.0	1.3	(2.3)	94.4	26.0 - 56.0	42.3	(16.2)	77.1
AGSM	2	0.000 - .159	.058	(1.9)		0.0 - .7	.2	(1.2)		0.0 - 3.0	1.0	(1.8)		0.0 - 30.0	10.0	(3.8)	
SPCR	3	0.000 - .175	.053	(1.8)		0.0 - .4	.1	(.5)		0.0 - 1.2	.4	(.7)		0.0 - 35.0	10.8	(4.1)	
SCPA	1		.030	(1.0)			.1	(.3)			.8	(1.4)			2.5	(1.0)	
ORHY	2	0.000 - .103	.028	(.9)		0.0 - .2	.1	(.4)		0.0 - .7	.2	(.3)		0.0 - 16.0	4.5	(1.7)	
SIHY	2	0.000 - .073	.023	(.8)		0.0 - .3	.1	(.4)		0.0 - .2	.1	(.1)		0.0 - 15.0	5.3	(2.0)	
GUSA	3	0.000 - .033	.019	(.6)		0.0 - .2	.1	(.4)		0.0 - .1	.1	(.1)		0.0 - 6.0	3.8	(1.4)	
TOIN	1		.015	(.5)			.0	(.1)			.3	(.5)			3.5	(1.3)	
COVI	2	0.000 - .030	.014	(.5)		0.0 - .1	.0	(.2)		0.0 - .1	.0	(.1)		0.0 - 10.0	3.8	(1.4)	
OPPO	2	0.000 - .025	.010	(.3)		0.0 - .1	.0	(.2)		0.0 - .1	.0	(0.0)		0.0 - 5.0	2.3	(.9)	
ASTR	1		.010	(.3)			.0	(0.0)			.1	(.1)			3.0	(1.2)	
POLO	1		.009	(.3)			.0	(.2)			.1	(.1)			2.5	(1.0)	
UNKF	1		.006	(.2)			0.0	(0.0)			.0	(.1)			2.0	(.8)	
SAVE2	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.3	(.5)	
LESQ	1		.004	(.1)			.0	(.1)			.0	(.1)			1.0	(.4)	
HASP2	1		.004	(.1)			.1	(.3)			.0	(0.0)			.5	(.2)	
ATOB	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
MURI1	1		.002	(.1)			0.0	(0.0)			.1	(.1)			.5	(.2)	
MACH	1		.002	(.1)			.0	(0.0)			.0	(0.0)			.5	(.2)	
LEPU	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
ARLO1	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
LINU	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
HELE	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
			3.000				17.4				57.3						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 17.—Vegetation and soil surface characteristics for plant community 12 (p.c.12).

COMMUNITY 12 : Artr-Gusa/Hija-Spai

SITES 2 3

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
2	7	15.2	0	6.8	8.4	5.9	0	85.7	40.0	1.59	17

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	2	.489 - .964	.727	(24.2)		1.5 - 2.9	2.2	(14.5)		7.6 - 22.3	14.9	(37.3)		55.0 - 56.0	55.5	(21.5)	
ARTR	2	.518 - .729	.624	(20.8)		5.3 - 7.2	6.2	(41.1)		.7 - 1.2	1.0	(2.4)		45.0 - 50.0	47.5	(18.4)	
SPAI	2	.517 - .646	.582	(19.4)		2.0 - 2.5	2.2	(14.8)		12.2 - 12.3	12.2	(30.6)		22.0 - 45.0	33.5	(13.0)	
BOGR	2	.296 - .308	.302	(10.1)		1.8 - 2.2	2.0	(13.2)		3.3 - 4.1	3.7	(9.2)		20.0 - 20.0	20.0	(7.7)	
SIHY	2	.089 - .377	.233	(7.8)		.1 - 1.7	.9	(5.8)		.8 - 5.0	2.9	(7.1)		14.0 - 40.0	27.0	(10.4)	
GUSA	2	.179 - .218	.199	(6.6)		.6 - .7	.6	(4.2)		1.1 - 1.2	1.1	(2.9)		30.0 - 34.0	32.0	(12.4)	
AGCR	1		.167	(5.6)	94.5		.6	(3.6)	97.2		3.0	(7.4)	96.9		15.0	(5.8)	89.2
AGSM	2	.020 - .073	.047	(1.6)		.1 - .2	.1	(.9)		.1 - .5	.3	(.7)		2.0 - 15.0	8.5	(3.3)	
ORHY	2	.001 - .071	.036	(1.2)		.0 - .3	.1	(.9)		0.0 - .8	.4	(.9)		0.0 - 10.0	5.0	(1.9)	
SCPA	2	.020 - .035	.028	(.9)		0.0 - .1	.1	(.5)		.1 - .3	.2	(.5)		4.0 - 5.0	4.5	(1.7)	
SPHA	1		.017	(.6)			0.0	(0.0)			.2	(.4)			3.0	(1.2)	
SPCR	1		.015	(.5)			.1	(.5)			.0	(.1)			2.0	(.8)	
STCO	1		.007	(.2)			.0	(.1)			.0	(.1)			1.0	(.4)	
ATOB	1		.006	(.2)			0.0	(0.0)			.1	(.2)			1.0	(.4)	
SAKA	1		.005	(.2)			0.0	(0.0)			.0	(.1)			1.0	(.4)	
LEER	1		.005	(.2)			0.0	(0.0)			.0	(.1)			1.0	(.4)	
ALLI	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.0	(.4)	
			3.000				15.2				40.0						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 18.—Vegetation and soil surface characteristics for plant community 13 (p.c.13).

COMMUNITY 13 : Artr-Gusa/Bogr-Agsm

SITES 140 141 142 143 144 145

No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[2]	D[1]	d[1]	SR[1]
6	9	24.8	0	10.6	14.2	16.0	0	69.8	34.3	1.66	41

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	6	.014 - 1.219	.680	(22.7)		.3 - 21.8	8.2	(33.1)		0.0 - 21.6	10.0	(29.2)		0.0 - 100.0	47.5	(13.0)	
AGSM	6	.314 - .939	.589	(19.6)		.8 - 2.1	1.5	(6.0)		4.3 - 16.1	11.9	(34.8)		35.0 - 90.0	59.2	(16.2)	
ARTR	6	.331 - 1.025	.581	(19.4)		4.5 - 17.7	9.7	(39.1)		.9 - 2.9	1.6	(4.7)		30.0 - 70.0	47.5	(13.0)	
AGDE	3	0.000 - .489	.190	(6.3)		0.0 - 4.8	1.3	(5.1)		0.0 - 5.3	1.8	(5.2)		0.0 - 60.0	25.0	(6.8)	
GUSA	5	0.000 - .278	.149	(5.0)		0.0 - 2.5	.7	(2.7)		0.0 - 2.9	1.0	(2.8)		0.0 - 90.0	36.7	(10.0)	
HIJA	4	0.000 - .412	.147	(4.9)		0.0 - 2.9	.8	(3.2)		0.0 - 6.9	2.4	(6.8)		0.0 - 35.0	15.0	(4.1)	
SIHY	5	0.000 - .390	.136	(4.5)	82.4	0.0 - 1.0	.5	(1.8)	91.0	0.0 - 2.4	.9	(2.7)	86.2	0.0 - 60.0	25.8	(7.1)	70.2
ASTR	3	0.000 - .233	.081	(2.7)		0.0 - 1.8	.3	(1.4)		0.0 - 3.2	1.0	(3.0)		0.0 - 40.0	15.0	(4.1)	
SPCR	5	0.000 - .183	.059	(2.0)		0.0 - .6	.2	(.7)		0.0 - 1.2	.4	(1.1)		0.0 - 45.0	15.0	(4.1)	
STCO1	3	0.000 - .192	.045	(1.5)		0.0 - 1.2	.2	(1.0)		0.0 - 1.0	.2	(.6)		0.0 - 35.0	9.2	(2.5)	
SEMU4	2	0.000 - .116	.039	(1.3)		0.0 - .4	.1	(.5)		0.0 - 1.7	.4	(1.0)		0.0 - 30.0	10.0	(2.7)	
SPAI	1		.036	(1.2)			.5	(2.0)			.3	(.9)			1.7	(.5)	
LEER	2	0.000 - .121	.035	(1.2)		0.0 - .3	.1	(.3)		0.0 - 2.0	.5	(1.3)		0.0 - 20.0	5.8	(1.6)	
CELA	1		.033	(1.1)			.2	(.8)			.2	(.6)			3.3	(.9)	
SPDI	4	0.000 - .112	.028	(.9)		0.0 - .2	.0	(.2)		0.0 - .9	.2	(.5)		0.0 - 40.0	9.2	(2.5)	
PSTA	1		.022	(.7)			.0	(.1)			.3	(.9)			6.7	(1.8)	
ASCE	1		.020	(.7)			.0	(.1)			.2	(.7)			3.3	(.9)	
CHDE	2	0.000 - .051	.016	(.5)		0.0 - .1	.0	(.1)		0.0 - .7	.2	(.5)		0.0 - 15.0	4.2	(1.1)	
ERLO1	1		.013	(.4)			.1	(.5)			.2	(.5)			1.7	(.5)	
MURI1	1		.010	(.3)			0.0	(0.0)			.2	(.4)			1.7	(.5)	
MUTO	1		.009	(.3)			.0	(.1)			.1	(.4)			.8	(.2)	
CYMO	1		.008	(.3)			0.0	(0.0)			.0	(0.0)			1.7	(.5)	
MUWR	1		.007	(.2)			.0	(0.0)			.1	(.2)			1.7	(.5)	
TAPA1	1		.007	(.2)			.0	(0.0)			.1	(.1)			2.5	(.7)	
ORHY	2	0.000 - .036	.007	(.2)		0.0 - .1	.0	(.1)		0.0 - .2	.0	(.1)		0.0 - 10.0	1.7	(.5)	
LALE	1		.006	(.2)			.0	(.1)			.1	(.2)			1.7	(.5)	
ERIO1	1		.006	(.2)			0.0	(0.0)			.0	(0.0)			1.7	(.5)	
POFE	1		.006	(.2)			.1	(.2)			.0	(.1)			1.7	(.5)	
MEOF	1		.005	(.2)			.0	(.1)			.1	(.2)			.8	(.2)	
THME	1		.005	(.2)			.0	(.1)			.0	(0.0)			1.7	(.5)	
HYRI	2	0.000 - .025	.004	(.1)		0.0 - .5	.1	(.4)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
PIED	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			1.7	(.5)	
POPA	1		.003	(.1)			.0	(0.0)			.1	(.1)			.8	(.2)	
GRAR	1		.003	(.1)			.0	(.1)			.0	(0.0)			.8	(.2)	
SEMU1	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.2)	
ORMU	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.2)	
COVI	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.2)	
ERMI	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.8	(.2)	
OPPO	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
ARNO	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
HASP	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			2.999				24.8				34.3						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 19.—Vegetation and soil surface characteristics for plant community 14 (p.c.14).

COMMUNITY 14 : Artr/Spcr-Orhy

SITES 153

No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[2]	D[1]	d[1]	SR[1]
1	3	21.8	0	3.9	17.9	17.2	0	64.9	23.3	1.91	24

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPCR	1		1.367	(45.6)			13.1	(59.9)			11.3	(48.5)			87.0	(28.4)	
ARTR	1		.416	(13.9)			3.3	(15.1)			3.1	(13.4)			40.0	(13.1)	
ERIO1	1		.202	(6.7)			1.9	(8.7)			1.7	(7.2)			13.0	(4.2)	
SPCO	1		.133	(4.4)			.5	(2.3)			1.3	(5.6)			17.0	(5.6)	
ASTE	1		.113	(3.8)			.1	(.5)			.5	(2.1)			27.0	(8.8)	
ORHY	1		.110	(3.7)			.4	(1.8)			.6	(2.7)			20.0	(6.5)	
HASP	1		.105	(3.5)	81.6		.1	(.3)	88.6		1.6	(6.9)	86.4		10.0	(3.3)	69.9
AGSM	1		.071	(2.4)			.1	(.4)			1.1	(4.6)			7.0	(2.3)	
CHNA	1		.058	(1.9)			.4	(1.8)			.2	(.7)			10.0	(3.3)	
STRO	1		.053	(1.8)			.0	(.1)			.2	(.9)			13.0	(4.2)	
BOGR	1		.050	(1.7)			.4	(1.8)			.2	(1.0)			7.0	(2.3)	
SIHY	1		.049	(1.6)			0.0	(0.0)			.1	(.6)			13.0	(4.2)	
OENO	1		.048	(1.6)			0.0	(0.0)			.4	(1.6)			10.0	(3.3)	
SPCO1	1		.040	(1.3)			.2	(.7)			.3	(1.2)			7.0	(2.3)	
PHYS	1		.035	(1.2)			.3	(1.4)			.2	(1.0)			3.0	(1.0)	
HIJA	1		.033	(1.1)			.4	(1.7)			.1	(.6)			3.0	(1.0)	
MIMU	1		.031	(1.0)			.7	(3.1)			0.0	(0.0)			0.0	(0.0)	
CORE	1		.026	(.9)			0.0	(0.0)			.1	(.4)			7.0	(2.3)	
LERE	1		.015	(.5)			0.0	(0.0)			.1	(.4)			3.0	(1.0)	
GUSA	1		.015	(.5)			0.0	(0.0)			.1	(.4)			3.0	(1.0)	
ATCO	1		.012	(.4)			0.0	(0.0)			.0	(.1)			3.0	(1.0)	
ASCE	1		.012	(.4)			0.0	(0.0)			.0	(.1)			3.0	(1.0)	
ATCA	1		.003	(.1)			.1	(.3)			0.0	(0.0)			0.0	(0.0)	
PSTA	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
			2.999				21.8				23.3						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 20.—Vegetation and soil surface characteristics for plant community 15 (p.c.15).

COMMUNITY 15 : Artr-Chpa/Arfe-Bogr

SITES 151

No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[2]	D[1]	d[1]	SR[1]
1	5	17.3	0	6.1	11.2	17.7	0.5	70.6	35.0	2.35	24

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
ARFE1	1		.649	(21.6)			4.3	(24.9)			7.8	(22.4)			66.0	(17.6)	
BOGR	1		.364	(12.1)			1.7	(9.8)			6.7	(19.2)			28.0	(7.5)	
ARTR	1		.348	(11.6)			3.1	(18.1)			3.2	(9.1)			28.0	(7.5)	
CHPA	1		.303	(10.1)			2.7	(15.8)			.8	(2.2)			46.0	(12.3)	
HIJA	1		.231	(7.7)			1.0	(5.7)			3.8	(11.0)			24.0	(6.4)	
SPA1	1		.166	(5.5)			1.1	(6.1)			2.4	(6.7)			14.0	(3.7)	
SPCR	1		.164	(5.5)			.3	(1.8)			1.7	(5.0)			36.0	(9.6)	
MURI	1		.140	(4.7)			.5	(2.7)			2.8	(8.1)			12.0	(3.2)	
ORHY	1		.129	(4.3)			.6	(3.5)			.9	(2.5)			26.0	(7.0)	
AGSM	1		.102	(3.4)	86.5		.4	(2.3)	85.3		1.8	(5.3)	91.5		10.0	(2.7)	83.5
CHVI2	1		.097	(3.2)			.5	(2.6)			.6	(1.7)			20.0	(5.3)	
THME	1		.064	(2.1)			.1	(.6)			1.1	(3.1)			10.0	(2.7)	
SIHY	1		.062	(2.1)			.2	(1.1)			.3	(.8)			16.0	(4.3)	
SEMU1	1		.043	(1.4)			.2	(1.1)			.2	(.5)			10.0	(2.7)	
OPPO	1		.030	(1.0)			0.0	(0.0)			.1	(.3)			10.0	(2.7)	
ASCE	1		.029	(1.0)			0.0	(0.0)			.4	(1.3)			6.0	(1.6)	
SAVE	1		.023	(.8)			.3	(1.7)			.0	(.1)			2.0	(.5)	
EUPH	1		.012	(.4)			0.0	(0.0)			.1	(.2)			4.0	(1.1)	
SPDI	1		.010	(.3)			0.0	(0.0)			.2	(.5)			2.0	(.5)	
LEER	1		.009	(.3)			.1	(.3)			.0	(.1)			2.0	(.5)	
DIST	1		.008	(.3)			.0	(.1)			.1	(.2)			2.0	(.5)	
VEBR	1		.006	(.2)			.1	(.6)			0.0	(0.0)			0.0	(0.0)	
SCPA	1		.006	(.2)			.1	(.6)			0.0	(0.0)			0.0	(0.0)	
SPCO2	1		.005	(.2)			.1	(.5)			0.0	(0.0)			0.0	(0.0)	
			3.000				17.3				35.0						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 21.—Vegetation and soil surface characteristics for plant community 16 (p.c.16).

COMMUNITY 16 : Arno-Artr/Agcr-Agsm

SITES 81

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	4	21.2	0	15.7	5.5	6.8	0	87.7	28.3	2.30	23

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
ARNO	1		.667	(22.2)			8.7	(40.9)			2.7	(9.5)			65.0	(16.0)	
AGCR	1		.524	(17.5)			1.5	(6.8)			8.1	(28.6)			68.0	(16.7)	
AGSM	1		.371	(12.4)			1.2	(5.6)			4.7	(16.5)			60.0	(14.7)	
ARTR	1		.292	(9.7)			4.8	(22.6)			.3	(.9)			23.0	(5.7)	
BOGR	1		.262	(8.7)			.7	(3.1)			4.2	(15.0)			33.0	(8.1)	
GUSA	1		.140	(4.7)			1.0	(4.6)			.7	(2.5)			28.0	(6.9)	
ERLO1	1		.136	(4.5)	79.7		.8	(3.8)	87.0		1.4	(4.8)	27.8		20.0	(4.9)	73.0
CHDE	1		.094	(3.1)			1.1	(5.3)			.3	(.9)			13.0	(3.2)	
ALCE	1		.092	(3.1)			.1	(.5)			1.6	(5.6)			13.0	(3.2)	
HYFI	1		.049	(1.6)			.0	(.1)			.3	(1.1)			15.0	(3.7)	
SPHA	1		.048	(1.6)			0.0	(0.0)			.5	(1.7)			13.0	(3.2)	
AGRO1	1		.042	(1.4)			.4	(1.8)			.5	(1.8)			3.0	(.7)	
MUHL	1		.041	(1.4)			.1	(.4)			.9	(3.1)			3.0	(.7)	
SENE	1		.037	(1.2)			.2	(.8)			.3	(1.0)			8.0	(2.0)	
MURI1	1		.036	(1.2)			.2	(1.1)			.6	(1.9)			3.0	(.7)	
OPIM	1		.034	(1.1)			.1	(.5)			.1	(.5)			10.0	(2.5)	
UNKF	1		.033	(1.1)			.1	(.6)			.4	(1.5)			5.0	(1.2)	
SIHY	1		.032	(1.1)			.1	(.4)			.3	(1.0)			8.0	(2.0)	
HIJA	1		.031	(1.0)			.1	(.2)			.5	(1.6)			5.0	(1.2)	
CAIN2	1		.015	(.5)			0.0	(0.0)			.1	(.3)			5.0	(1.2)	
ORHY	1		.014	(.5)			.1	(.6)			.1	(.2)			3.0	(.7)	
CHNA	1		.008	(.3)			0.0	(0.0)			.1	(.2)			3.0	(.7)	
SCPA	1		.002	(.1)			.1	(.2)			0.0	(0.0)			0.0	(0.0)	
			3.000				21.2				28.3						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 22.—Vegetation and soil surface characteristics for plant community 17 (p.c.17).

COMMUNITY 17 : Arno-Gusa/Bogr-Hija

SITES 38

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	1	12.0	0	6.7	5.3	13.4	0.1	81.2	28.9	1.48	15

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	1		1.321	(44.1)			2.8	(23.4)			22.4	(77.6)			90.0	(31.0)	
GUSA	1		.377	(12.6)			2.9	(24.3)			.9	(3.1)			30.0	(10.3)	
ARNO	1		.370	(12.3)			3.0	(25.1)			.5	(1.6)			30.0	(10.3)	
HIJA	1		.281	(9.4)			.6	(4.6)			2.8	(9.7)			40.0	(13.8)	
ERIO1	1		.127	(4.2)			.8	(6.7)			.3	(.9)			15.0	(5.2)	
LEPU	1		.109	(3.6)	86.2		.2	(1.3)	85.4		.8	(2.8)	95.7		20.0	(6.9)	77.5
UNK9	1		.092	(3.1)			.4	(3.3)			.2	(.7)			15.0	(5.2)	
HASP2	1		.090	(3.0)			.1	(.4)			.5	(1.7)			20.0	(6.9)	
SIHY	1		.069	(2.3)			.1	(.8)			.3	(.9)			15.0	(5.2)	
ARLO1	1		.068	(2.3)			.3	(2.5)			.3	(.9)			10.0	(3.4)	
CHNA	1		.042	(1.4)			.5	(4.2)			0.0	(0.0)			0.0	(0.0)	
MUWR	1		.021	(.7)			.3	(2.1)			0.0	(0.0)			0.0	(0.0)	
ARAB	1		.019	(.6)			0.0	(0.0)			.1	(.2)			5.0	(1.7)	
MUMO1	1		.008	(.3)			.1	(.8)			0.0	(0.0)			0.0	(0.0)	
KOCR	1		.004	(.1)			.1	(.4)			0.0	(0.0)			0.0	(0.0)	
			2.998				12.0				28.9						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 23.—Vegetation and soil surface characteristics for plant community 18 (p.c.18).

COMMUNITY 18 : Chnab/Bogr-Agsm

SITES 136

	Mean[1]											
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
1	2	37.7	0	8.1	29.6	16.3	0.1	54.0	37.3	1.47	18

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	1		1.373	(45.8)			24.4	(64.7)			16.6	(44.6)			80.0	(28.1)	
AGSM	1		.550	(18.3)			2.0	(5.3)			12.0	(32.1)			50.0	(17.5)	
HIJA	1		.229	(7.6)			1.3	(3.4)			4.0	(10.7)			25.0	(8.8)	
SPCR	1		.186	(6.2)			.6	(1.6)			1.8	(4.7)			35.0	(12.3)	
CHNA	1		.138	(4.6)			5.2	(13.8)			0.0	(0.0)			0.0	(0.0)	
ARFE1	1		.100	(3.3)	85.8		.6	(1.5)	90.3		.6	(1.5)	93.6		20.0	(7.0)	73.7
CHPA	1		.093	(3.1)			1.3	(3.4)			.3	(.7)			15.0	(5.3)	
GUSA	1		.077	(2.6)			.5	(1.2)			.5	(1.2)			15.0	(5.3)	
ARTR	1		.071	(2.4)			1.1	(2.9)			.3	(.7)			10.0	(3.5)	
AGDE	1		.060	(2.0)			.1	(.3)			.8	(2.1)			10.0	(3.5)	
SIHY	1		.025	(.8)			.0	(.1)			.3	(.7)			5.0	(1.8)	
MURI1	1		.023	(.8)			0.0	(0.0)			.2	(.5)			5.0	(1.8)	
ARLO1	1		.020	(.7)			0.0	(0.0)			.1	(.3)			5.0	(1.8)	
SCPA	1		.019	(.6)			0.0	(0.0)			.1	(.1)			5.0	(1.8)	
GRIN	1		.019	(.6)			0.0	(0.0)			.1	(.1)			5.0	(1.8)	
SPIN	1		.009	(.3)			.4	(.9)			0.0	(0.0)			0.0	(0.0)	
SPHA	1		.007	(.2)			.3	(.7)			0.0	(0.0)			0.0	(0.0)	
ORHY	1		.001	(0.0)			.1	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				37.7				37.3						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 24.—Vegetation and soil surface characteristics for plant community 19 (p.c.19).

COMMUNITY 19 : Chpa/Hija-Bogr

SITES 77 134 135

	Mean[1]											
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
3	6	27.1	0	5.9	21.3	10.6	0	78.7	75.0	1.22	24

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	3	.338 - 1.962	.997	(33.2)		3.5 - 16.9	9.5	(35.2)		5.3 - 110.3	41.6	(55.5)		40.0 - 95.0	61.7	(20.4)	
HIJA	3	.162 - .897	.615	(20.5)		.9 - 9.5	5.0	(18.3)		3.1 - 20.3	12.9	(17.2)		23.0 - 90.0	64.3	(21.3)	
AGSM	3	.015 - .562	.320	(10.7)		.1 - 4.2	1.5	(5.7)		.0 - 15.4	8.8	(11.8)		3.0 - 60.0	34.3	(11.3)	
SPAI	3	.001 - .481	.201	(6.7)		.0 - 4.2	2.2	(8.1)		0.0 - 5.0	2.0	(2.7)		0.0 - 60.0	23.3	(7.7)	
CHPA	3	.152 - .340	.188	(11.4)		2.9 - 4.6	2.9	(21.5)		.2 - .7	.4	(.7)		10.0 - 40.0	23.3	(11.0)	
MURI1	2	0.000 - .548	.187	(6.2)		0.0 - 5.4	1.8	(6.6)		0.0 - 14.0	4.7	(6.2)		0.0 - 50.0	17.7	(5.8)	
SPCR	3	.074 - .168	.116	(3.9)	92.6	.2 - 1.1	.6	(2.0)	97.4	.4 - 2.7	1.3	(1.8)	95.9	20.0 - 20.0	20.0	(6.6)	86.1
MUTO	2	0.000 - .058	.033	(1.1)		0.0 - .1	.1	(.2)		0.0 - 5.3	2.0	(2.6)		0.0 - 10.0	4.3	(1.4)	
SPDI	2	0.000 - .066	.022	(.7)		0.0 - .9	.3	(1.2)		0.0 - .5	.2	(.2)		0.0 - 10.0	3.3	(1.1)	
ARLO1	1		.022	(.7)			.1	(.5)			.2	(.2)			3.3	(1.1)	
OPIM	2	0.000 - .036	.022	(.7)		0.0 - 0.0	0.0	(0.0)		0.0 - .2	.1	(.1)		0.0 - 10.0	6.7	(2.2)	
MACH	1		.017	(.6)			.0	(.1)			.1	(.1)			3.3	(1.1)	
CELA	1		.013	(.4)			0.0	(0.0)			.1	(.2)			3.3	(1.1)	
ORHY	1		.013	(.4)			0.0	(0.0)			.1	(.1)			3.3	(1.1)	
GRAP	1		.012	(.4)			.1	(.2)			.1	(.1)			3.3	(1.1)	
LEER	1		.012	(.4)			0.0	(0.0)			.1	(.1)			3.3	(1.1)	
HASP	1		.012	(.4)			.0	(0.0)			.1	(.2)			3.3	(1.1)	
SPHA	1		.010	(.3)			0.0	(0.0)			.0	(0.0)			3.3	(1.1)	
CRFU	1		.009	(.3)			.0	(.1)			.1	(.1)			1.7	(.6)	
SIHY	2	0.000 - .026	.009	(.3)		0.0 - .1	.0	(.1)		0.0 - .1	.0	(0.0)		0.0 - 5.0	1.7	(.6)	
ERIO1	1		.008	(.3)			.0	(0.0)			.0	(0.0)			1.7	(.6)	
ARTR	1		.007	(.2)			.1	(.3)			.0	(0.0)			1.0	(.3)	
UNKF	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.3)	
			3.001				27.1				75.0						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 25.—Vegetation and soil surface characteristics for plant community 20 (p.c.20).

COMMUNITY 20 : Chnag/Bogr-Agsm

SITES 133

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	1	49.5	0	9.0	40.5	24.1	0	35.4	29.5	0.74	7

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	1		2.100	(70.0)			37.2	(75.1)			22.1	(74.9)			90.0	(60.0)	
AGSM	1		.357	(11.9)			2.0	(4.0)			5.4	(18.3)			20.0	(13.3)	
SPCR	1		.272	(9.1)			.9	(1.8)			1.6	(5.4)			30.0	(20.0)	
CHNAG	1		.174	(5.8)	96.8		8.6	(17.4)	98.3		0.0	(0.0)	98.6		0.0	(0.0)	93.3
MURI1	1		.080	(2.7)			0.0	(0.0)			.4	(1.4)			10.0	(6.7)	
SPHA	1		.010	(.3)			.5	(1.0)			0.0	(0.0)			0.0	(0.0)	
ARTR	1		.007	(.2)			.4	(.7)			0.0	(0.0)			0.0	(0.0)	
			3.000				49.5				29.5						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 26.—Vegetation and soil surface characteristics for plant community 21 (p.c.21).

COMMUNITY 21 : Save

SITES 12 78

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
2	5	28.6	0	28.6	0	15.1	0	84.9	13.6	0.17	3

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SAVE2	2	1.094 - 2.945	2.020	(67.3)		14.4 - 23.0	18.7	(65.2)		1.5 - 12.7	7.1	(52.5)		76.0 - 80.0	78.0	(60.9)	
ATRI	1		.953	(31.8)			9.6	(33.3)			6.5	(47.5)			50.0	(39.1)	
CHNA	1		.028	(.9)			.4	(1.5)			0.0	(0.0)			0.0	(0.0)	
			3.000				28.6				13.6						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 27.—Vegetation and soil surface characteristics for plant community 22 (p.c.22).

COMMUNITY 22 : Save/Slhy-Agsm

SITES 150

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	5	15.0	0	9.0	6.0	8.7	0	85.3	28.8	1.09	9

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SAVE	1		1.005	(33.5)			8.4	(55.9)			2.4	(8.5)			88.0	(36.1)	
SIHY	1		.976	(32.5)			4.1	(27.0)			9.9	(34.6)			88.0	(36.1)	
AGSM	1		.817	(27.2)	93.2		1.6	(10.5)	93.0		15.3	(53.1)	96.2		44.0	(18.0)	90.2
CHNA	1		.071	(2.4)			.4	(2.5)			.1	(.5)			10.0	(4.1)	
SPAI	1		.068	(2.3)			.4	(2.7)			.5	(1.7)			6.0	(2.5)	
ARTR	1		.030	(1.0)			.1	(.5)			.3	(.9)			4.0	(1.6)	
HIJA	1		.018	(.6)			.0	(.3)			.2	(.7)			2.0	(.8)	
CHPA	1		.009	(.3)			0.0	(0.0)			.0	(.1)			2.0	(.8)	
ATCA	1		.007	(.2)			.1	(.7)			0.0	(0.0)			0.0	(0.0)	
			3.001				15.0				28.8						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 28.—Vegetation and soil surface characteristics for plant community 23 (p.c.23).

COMMUNITY 23 : Cela-Gusa/Hija

SITES	No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[2]	D[1]	d[1]	SR[1]
48 56 73 74 75 138 147	7	17	12.5	0	5.4	7.1	3.0	0.2	89.7	20.9	1.60	36

(C through SR: Mean[1])

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	7	.739 - 1.591	1.147	(38.3)		1.7 - 6.5	4.0	(31.9)		6.7 - 17.3	11.8	(56.4)		60.0 - 90.0	76.7	(23.8)	
GUSA	7	.197 - .823	.519	(17.3)		.4 - 7.2	3.4	(27.6)		1.4 - 3.2	2.2	(10.4)		20.0 - 77.0	59.1	(18.4)	
CELA	7	.111 - .556	.300	(10.0)		.3 - 3.4	1.7	(13.3)		.4 - 2.0	.9	(4.2)		13.0 - 73.0	34.4	(10.7)	
SPAI	5	0.000 - .485	.140	(4.7)		0.0 - 3.5	.8	(6.6)		0.0 - 2.3	.6	(2.9)		0.0 - 30.0	11.4	(3.5)	
SIHY	7	.037 - .336	.137	(4.6)		0.0 - .8	.2	(1.2)		.1 - 1.8	.7	(3.3)		10.0 - 83.0	31.6	(9.8)	
BOGR	7	.069 - .185	.115	(3.8)		.0 - 1.3	.4	(3.2)		.6 - 1.7	.9	(4.5)		3.0 - 40.0	12.3	(3.8)	
ORHY	6	0.000 - .279	.101	(3.4)	82.1	0.0 - 1.0	.3	(2.4)	86.2	0.0 - 1.2	.4	(2.1)	83.8	0.0 - 53.0	16.1	(5.0)	77.0
SPCR	6	0.000 - .181	.086	(2.9)		0.0 - .3	.1	(1.1)		0.0 - 1.3	.4	(2.0)		0.0 - 35.0	18.9	(5.9)	
MUTO	5	0.000 - .169	.073	(2.4)		0.0 - .3	.2	(1.2)		0.0 - 2.3	.8	(3.7)		0.0 - 17.0	8.9	(2.7)	
SPNE1	1		.064	(2.1)			.5	(4.1)			.3	(1.5)			4.3	(1.3)	
UNKF	4	0.000 - .175	.055	(1.8)		0.0 - .5	.1	(1.1)		0.0 - 1.9	.5	(2.6)		0.0 - 15.0	5.9	(1.8)	
SPHA	5	0.000 - .108	.052	(1.7)		0.0 - .2	.1	(.6)		0.0 - 1.0	.4	(1.8)		0.0 - 23.0	9.3	(2.9)	
ARLO1	3	0.000 - .117	.043	(1.4)		0.0 - .3	.1	(.7)		0.0 - 1.3	.3	(1.6)		0.0 - 23.0	7.6	(2.3)	
LEER	2	0.000 - .149	.027	(.9)		0.0 - .9	.1	(1.0)		0.0 - .9	.2	(.9)		0.0 - 13.0	2.6	(.8)	
ARTR	1		.018	(.6)			.1	(1.2)			.0	(.1)			1.4	(.4)	
HASP2	1		.014	(.5)			.0	(.4)			.1	(.3)			2.4	(.8)	
SPDI	1		.012	(.4)			0.0	(0.0)			.1	(.2)			2.1	(.7)	
OPPO	3	0.000 - .044	.010	(.3)		0.0 - .1	.0	(.1)		0.0 - .1	.0	(.1)		0.0 - 10.0	2.3	(.7)	
SPCO	2	0.000 - .035	.009	(.3)		0.0 - .2	.0	(.2)		0.0 - .1	.0	(.1)		0.0 - 10.0	2.1	(.7)	
OPIM	3	0.000 - .033	.009	(.3)		0.0 - .3	.1	(.5)		0.0 - .1	.0	(0.0)		0.0 - 5.0	.7	(.2)	
STNE	2	0.000 - .033	.008	(.3)		0.0 - .1	.0	(.1)		0.0 - .2	.0	(.2)		0.0 - 7.0	2.0	(.6)	
ASTR	2	0.000 - .034	.007	(.2)		0.0 - .0	.0	(0.0)		0.0 - .1	.0	(.1)		0.0 - 10.0	1.9	(.6)	
ERIO1	1		.006	(.2)			.0	(0.0)			.0	(.1)			1.0	(.3)	
HASP	1		.005	(.2)			0.0	(0.0)			.0	(.1)			1.4	(.4)	
ARBI2	1		.005	(.2)			0.0	(0.0)			.0	(.1)			1.4	(.4)	
YUGL	2	0.000 - .030	.005	(.2)		0.0 - .4	.1	(.4)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
SOLA	1		.005	(.2)			0.0	(0.0)			.0	(.2)			1.0	(.3)	
ARBI	1		.005	(.2)			.0	(.3)			0.0	(0.0)			0.0	(0.0)	
BOER1	1		.004	(.1)			0.0	(0.0)			.0	(.2)			1.0	(.3)	
ATCO	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			.7	(.2)	
ARNO	1		.004	(.1)			.0	(.1)			.0	(0.0)			.4	(.1)	
OPCL	2	0.000 - .015	.003	(.1)		0.0 - .1	.0	(.1)		0.0 - .0	.0	(0.0)		0.0 - 3.0	.4	(.1)	
ATCA	2	0.000 - .010	.003	(.1)		0.0 - .2	.0	(.3)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
FRJA	1		.002	(.1)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
BOER	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
COVI	1		.001	(0.0)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
			2.998				12.5				20.9						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 29.—Vegetation and soil surface characteristics for plant community 24 (p.c.24).

COMMUNITY 24 : Cela-Gusa/Bogr

SITES 50 55 158

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
3	9	14.9	0	2.9	12.0	3.5	0	84.5	42.0	1.09	29

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	3	1.182 - 1.694	1.400	(46.7)		4.9 - 13.2	7.8	(52.3)		16.0 - 45.7	28.0	(66.6)		60.0 - 90.0	73.3	(24.9)	
HIJA	3	.547 - .710	.651	(21.7)		1.9 - 3.0	2.5	(16.5)		6.6 - 12.2	9.0	(21.3)		63.0 - 75.0	69.3	(23.5)	
GUSA	3	.140 - .419	.282	(9.4)		.6 - 2.2	1.5	(10.1)		.3 - 2.2	1.3	(3.0)		17.0 - 60.0	45.7	(15.5)	
CELA	3	0.000 - .197	.183	(6.1)	83.9	0.4 - 1.2	1.0	(6.8)	85.7	0.3 - .5	.6	(1.2)	92.1	14.3 - 25.0	18.3	(9.6)	73.5
MUTO	3	.001 - .247	.091	(3.0)		.0 - 1.4	.6	(3.7)		0.0 - 3.0	1.0	(2.4)		0.0 - 20.0	6.7	(2.3)	
STNE	1		.056	(1.9)			.3	(2.0)			.5	(1.1)			6.7	(2.3)	
SPAI	3	.015 - .084	.056	(1.9)		.2 - 1.3	.6	(4.2)		0.0 - .3	.2	(.4)		0.0 - 7.0	4.0	(1.4)	
ORHY	2	0.000 - .100	.052	(1.7)		0.0 - .1	.0	(.3)		0.0 - 1.0	.4	(.9)		0.0 - 25.0	11.7	(4.0)	
SIHY	2	0.000 - .081	.047	(1.6)		0.0 - .1	.0	(.2)		0.0 - .5	.3	(.7)		0.0 - 25.0	12.7	(4.3)	
SPCR	3	.021 - .056	.042	(1.4)		.0 - .1	.1	(.5)		.1 - .3	.2	(.5)		3.0 - 15.0	9.3	(3.2)	
STIP	1		.029	(1.0)			.2	(1.0)			.2	(.6)			5.0	(1.7)	
LEER	1		.020	(.7)			.0	(0.0)			.2	(.5)			5.0	(1.7)	
JUMO	1		.012	(.4)			.2	(1.1)			0.0	(0.0)			0.0	(0.0)	
OPCL	1		.009	(.3)			.1	(.4)			.0	(.1)			1.7	(.6)	
CRYP	1		.008	(.3)			.0	(.1)			.1	(.2)			1.7	(.6)	
TETR	1		.007	(.2)			.0	(.1)			.0	(.1)			1.7	(.6)	
SPHA	1		.007	(.2)			0.0	(0.0)			.1	(.1)			1.7	(.6)	
HAGR1	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.0	(.3)	
COVI	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.0	(.3)	
ATCA	1		.005	(.2)			.1	(.4)			0.0	(0.0)			0.0	(0.0)	
TAPA1	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.7	(.6)	
SPDI	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.7	(.6)	
EPVI	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.7	(.6)	
ARNO	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			1.7	(.6)	
ERIO1	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.3)	
ARTR	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			1.0	(.3)	
SCPA	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
ARFE1	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
			3.000				14.9				42.0						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 30.—Vegetation and soil surface characteristics for plant community 25 (p.c.25).

COMMUNITY 25 : Atcu-Frja/Spai

SITES 88

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	2	15.5	0	10.4	5.1	0	4.9	90.0	7.8	1.78	13

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPAI	1		1.033	(34.4)			3.3	(21.3)			3.8	(48.7)			90.0	(33.3)	
ATCU	1		.510	(17.0)			4.4	(28.4)			.9	(11.5)			30.0	(11.1)	
FRJA	1		.416	(13.9)			4.9	(31.6)			.2	(2.6)			20.0	(7.4)	
CELA	1		.225	(7.5)			.2	(1.3)			.5	(6.4)			40.0	(14.8)	
HIJA	1		.202	(6.7)			.4	(2.6)			.8	(10.3)			20.0	(7.4)	
UNKF	1		.140	(4.7)			.4	(2.6)			.6	(7.7)			10.0	(3.7)	
SPCO	1		.114	(3.8)			.8	(5.2)			.2	(2.6)			10.0	(3.7)	
YUGL	1		.108	(3.6)	91.6		.9	(5.8)	98.8		.1	(1.3)	91.1		10.0	(3.7)	85.2
OPCL	1		.075	(2.5)			0.0	(0.0)			.3	(3.8)			10.0	(3.7)	
ASTR	1		.063	(2.1)			0.0	(0.0)			.2	(2.6)			10.0	(3.7)	
SUSU	1		.050	(1.7)			0.0	(0.0)			.1	(1.3)			10.0	(3.7)	
BOGR	1		.050	(1.7)			0.0	(0.0)			.1	(1.3)			10.0	(3.7)	
ECHI1	1		.013	(.4)			.2	(1.3)			0.0	(0.0)			0.0	(0.0)	
			2.999				15.5				7.8						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 31.—Vegetation and soil surface characteristics for plant community 26 (p.c.26).

COMMUNITY 26 : Atob/Spai-Spcr

SITES 65 68

No. Sites	No. Trans.	Mean[1] C	TC	SC	HC	L	R	BS[2]	D	d	SR
2	4	19.9	0	15.1	4.8	5.2	0	90.0	12.1	0.24	8

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
ATOB	2	.523 - 3.000	1.762	(58.7)		6.0 - 22.3	14.2	(71.2)		.3 - 9.2	4.7	(39.1)		20.0 - 100.0	60.0	(53.6)	
SPAI	1		1.001	(33.4)			4.4	(22.2)			6.6	(54.2)			38.5	(34.4)	
SPCR	1		.120	(4.0)	96.1		.1	(.3)	93.7		.7	(6.1)	99.4		8.5	(7.6)	95.6
OPIM	1		.052	(1.7)			.9	(4.5)			0.0	(0.0)			0.0	(0.0)	
SIHY	1		.046	(1.5)			0.0	(0.0)			.1	(.7)			5.0	(4.5)	
HIJA	1		.016	(.5)			.3	(1.4)			0.0	(0.0)			0.0	(0.0)	
BOGR	1		.003	(.1)			.1	(.3)			0.0	(0.0)			0.0	(0.0)	
OPPO	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				19.9				12.1						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 32.—Vegetation and soil surface characteristics for plant community 27 (p.c.27).

COMMUNITY 27 : Atob-Gusa/Hija-Spai

SITES 46 47

No. Sites	No. Trans.	Mean[1] C	TC	SC	HC	L	R	BS[2]	D	d	SR
2	6	9.3	0	3.0	6.3	2.7	0.1	90.9	14.4	1.10	14

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	2	1.274 - 1.309	1.292	(43.1)		2.3 - 4.2	3.3	(34.9)		7.4 - 11.1	9.3	(64.5)		50.0 - 53.0	51.5	(30.7)	
SPAI	2	.537 - .811	.674	(22.5)		2.5 - 3.3	2.9	(30.8)		1.4 - 3.7	2.5	(17.5)		20.0 - 37.0	28.5	(17.0)	
ATOB	2	.397 - .472	.435	(14.5)		1.5 - 2.2	1.8	(19.6)		.7 - .8	.8	(5.2)		23.0 - 40.0	31.5	(18.8)	
GUSA	2	.278 - .405	.342	(11.4)		.6 - 1.4	1.0	(10.4)		.6 - .9	.7	(5.0)		30.0 - 33.0	31.5	(18.8)	
SPCR	2	.027 - .199	.113	(3.8)	95.3	.0 - .1	.1	(.9)	96.6	.0 - 1.4	.7	(5.1)	97.3	3.0 - 17.0	10.0	(6.0)	91.3
CELA	1		.030	(1.0)			.1	(.5)			.1	(.5)			3.5	(2.1)	
SCPA	1		.027	(.9)			0.0	(0.0)			.1	(.5)			3.5	(2.1)	
UNKF	1		.022	(.7)			0.0	(0.0)			.2	(1.4)			1.5	(.9)	
ASTR	1		.021	(.7)			0.0	(0.0)			.0	(.2)			3.5	(2.1)	
MUTO	1		.012	(.4)			.1	(.9)			0.0	(0.0)			0.0	(0.0)	
SPHA	1		.010	(.3)			.1	(1.2)			0.0	(0.0)			0.0	(0.0)	
SIHY	1		.010	(.3)			0.0	(0.0)			.0	(.1)			1.5	(.9)	
OPIM	1		.009	(.3)			0.0	(0.0)			0.0	(0.0)			1.5	(.9)	
OPPO	1		.006	(.2)			.1	(.7)			0.0	(0.0)			0.0	(0.0)	
			3.000				9.3				14.4						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ≥ 0.1.*

Table 33.—Vegetation and soil surface characteristics for plant community 28 (p.c.28).

COMMUNITY 28 : Atca/Hija

SITES 132

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
1	1	14.8	0	11.6	3.2	13.4	0.1	83.3	7.1	1.48	10

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
ATCA	1		.707	(23.6)			10.5	(70.7)			0.0	(0.0)			0.0	(0.0)	
HIJA	1		.669	(22.3)			1.0	(6.6)			3.1	(43.7)			20.0	(16.7)	
SPCO	1		.378	(12.6)			.0	(.2)			.9	(12.7)			30.0	(25.0)	
DIST	1		.371	(12.4)			.1	(.7)			1.4	(19.7)			20.0	(16.7)	
SPNE1	1		.349	(11.6)			.4	(2.7)			1.1	(15.5)			20.0	(16.7)	
GUSA	1		.308	(10.3)			1.1	(7.1)			.5	(7.0)			20.0	(16.7)	
ARFE1	1		.118	(3.9)	96.7		.3	(2.0)	90.0		.1	(1.4)	100		10.0	(8.3)	100
SPAI	1		.063	(2.1)			.9	(6.3)			0.0	(0.0)			0.0	(0.0)	
BOGR	1		.036	(1.2)			.5	(3.6)			0.0	(0.0)			0.0	(0.0)	
SIHY	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
			3.001				14.8				7.1						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 34.—Vegetation and soil surface characteristics for plant community 29 (p.c.29).

COMMUNITY 29 : Atca/Spai-Sihy

SITES 59 70 107 139

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
4	12	18.1	0	12.1	6.0	17.0	0	77.0	9.0	1.48	26

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPAI	4	.339 - 1.342	.947	(31.6)		2.8 - 6.2	4.2	(23.3)		.3 - 8.3	4.5	(50.6)		7.0 - 55.0	34.8	(27.3)	
ATCA	4	.339 - 1.162	.780	(26.0)		3.1 - 21.2	9.9	(54.6)		.1 - 1.1	.6	(6.7)		10.0 - 55.0	26.5	(20.8)	
SIHY	3	0.000 - .473	.234	(7.8)		0.0 - 1.7	.5	(3.0)		0.0 - 2.3	.9	(9.9)		0.0 - 15.0	9.8	(7.6)	
GUSA	4	.098 - .199	.147	(4.9)		.3 - .8	.6	(3.1)		.1 - .8	.3	(2.9)		5.0 - 15.0	9.8	(7.6)	
SPCR	4	.004 - .356	.123	(4.1)		0.0 - .2	.1	(.5)		0.0 - 1.2	.5	(5.7)		0.0 - 30.0	10.5	(8.2)	
SPCO	2	0.000 - .481	.121	(4.0)	78.4	0.0 - .7	.2	(1.0)	85.5	0.0 - 2.3	.6	(6.3)	82.1	0.0 - 25.0	6.3	(4.9)	76.4
ATCO	2	0.000 - .330	.097	(3.2)		0.0 - 1.7	.5	(2.6)		0.0 - .2	.1	(.7)		0.0 - 13.0	4.0	(3.1)	
HIJA	1		.090	(3.0)			.4	(2.0)			.4	(4.2)			2.5	(2.0)	
SPIN	2	0.000 - .262	.076	(2.5)		0.0 - .1	.0	(.2)		0.0 - .5	.1	(1.6)		0.0 - 7.0	2.5	(2.0)	
ATOB	2	0.000 - .155	.065	(2.2)		0.0 - .8	.4	(2.1)		0.0 - .1	.0	(.4)		0.0 - 7.0	3.0	(2.4)	
UNKF	1		.056	(1.9)			.3	(1.5)			.3	(2.8)			6.3	(4.9)	
SCPA	1		.049	(1.6)			0.0	(0.0)			.1	(1.3)			.8	(.6)	
PORT	1		.044	(1.5)			.0	(.1)			.1	(.8)			1.8	(1.4)	
SAVE2	1		.037	(1.2)			.6	(3.4)			0.0	(0.0)			0.0	(0.0)	
PAOB	1		.025	(.8)			.1	(.6)			.3	(2.8)			1.3	(1.0)	
BOGR	1		.022	(.7)			.1	(.6)			.0	(.4)			1.3	(1.0)	
MURI1	1		.019	(.6)			.0	(.1)			.2	(2.1)			1.3	(1.0)	
MAVU	1		.016	(.5)			.1	(.3)			.0	(.3)			2.5	(2.0)	
GRCA	1		.013	(.4)			.0	(0.0)			.0	(.1)			.8	(.6)	
UKGRS	1		.013	(.4)			0.0	(0.0)			.0	(.1)			.8	(.6)	
SPFL	1		.013	(.4)			0.0	(0.0)			.0	(.4)			1.3	(1.0)	
CHVI2	2	0.000 - .020	.008	(.3)		0.0 - .3	.1	(.7)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
ARLO1	2	0.000 - .013	.004	(.1)		0.0 - .0	.0	(0.0)		0.0 - .0	.0	(0.0)		0.0 - 1.0	.3	(.2)	
SEMU1	1		.002	(.1)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
SOLA	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
ARTR	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				18.1				9.0						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 35.—Vegetation and soil surface characteristics for plant community 30 (p.c.30).

COMMUNITY 30 : Atca-Gusa/Bogr-Spcr

SITES 42 95

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
2	6	8.3	0	5.2	3.1	3.8	0	93.1	8.4	2.04	19

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
GUSA	2	.441 - .851	.646	(21.5)		2.4 - 3.3	2.9	(34.5)		.4 - 1.6	1.0	(12.2)		30.0 - 47.0	38.5	(16.3)	
BOGR	2	.443 - .517	.480	(16.0)		.8 - .9	.9	(10.5)		1.7 - 3.1	2.4	(28.7)		10.0 - 30.0	20.0	(8.5)	
SPCR	2	.409 - .463	.436	(14.5)		.3 - .4	.4	(4.2)		1.5 - 1.9	1.7	(20.4)		40.0 - 50.0	45.0	(19.1)	
SPCO	2	.223 - .375	.299	(10.0)		.2 - 1.4	.8	(9.5)		.5 - .7	.6	(7.2)		33.0 - 33.0	33.0	(14.0)	
SPFL	2	.221 - .347	.284	(9.5)		.1 - 1.1	.6	(7.1)		.7 - .8	.7	(8.8)		30.0 - 33.0	31.5	(13.4)	
ATCA	2	.239 - .272	.256	(8.5)		1.1 - 2.3	1.7	(20.6)		.1 - .2	.1	(1.4)		7.0 - 13.0	10.0	(4.2)	
SPHA	2	.021 - .240	.131	(4.3)		0.0 - .0	.0	(.2)		.1 - .6	.3	(3.8)		3.0 - 37.0	20.0	(8.5)	
UNKF	2	.078 - .163	.121	(4.0)	88.3	.0 - .1	.1	(.6)	87.2	.2 - .6	.4	(5.1)	87.6	10.0 - 20.0	15.0	(6.4)	90.4
HIJA	2	.043 - .124	.084	(2.8)		.0 - .1	.1	(.8)		.2 - .6	.4	(4.8)		3.0 - 10.0	6.5	(2.8)	
SPAI	2	.003 - .125	.064	(2.1)		.0 - .3	.2	(2.0)		0.0 - .5	.2	(2.8)		0.0 - 7.0	3.5	(1.5)	
ARLO1	2	.010 - .115	.063	(2.1)		.1 - .4	.2	(2.7)		0.0 - .5	.3	(3.0)		0.0 - 3.0	1.5	(.6)	
OPPO	2	.015 - .091	.053	(1.8)		.1 - .5	.3	(3.5)		0.0 - .1	.1	(.6)		0.0 - 7.0	3.5	(1.5)	
ORHY	1		.024	(.8)			.1	(1.6)			.0	(.2)			1.5	(.6)	
OPIM	2	.019 - .025	.022	(.7)		0.0 - .2	.1	(1.0)		0.0 - .0	.0	(.2)		0.0 - 3.0	1.5	(.6)	
YUGL	1		.011	(.3)			0.0	(0.0)			.0	(.4)			1.5	(.6)	
HASP2	2	.003 - .017	.010	(.3)		0.0 - .0	.0	(.2)		0.0 - .0	.0	(.2)		0.0 - 3.0	1.5	(.6)	
ASTR	1		.009	(.3)			0.0	(0.0)			.0	(.2)			1.5	(.6)	
OPCL	1		.008	(.2)			.1	(.6)			0.0	(0.0)			0.0	(0.0)	
MENT1	1		.005	(.2)			.0	(.4)			0.0	(0.0)			0.0	(0.0)	
			3.002				8.3				8.4						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 36.—Vegetation and soil surface characteristics for plant community 31 (p.c.31).

COMMUNITY 31 : Bogr-Hija

SITES 159 160

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
2	3	31.2	0	0.3	30.9	2.3	0	66.8	25.7	1.33	13

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	2	1.129 - 1.195	1.162	(38.7)		8.9 - 19.3	14.1	(45.2)		10.3 - 10.8	10.5	(41.0)		80.0 - 85.0	82.5	(30.8)	
HIJA	2	.804 - .831	.818	(27.2)		5.5 - 7.4	6.5	(20.7)		7.5 - 11.4	9.5	(36.8)		60.0 - 70.0	65.0	(24.3)	
SPCR	2	.360 - .445	.403	(13.4)		1.6 - 3.2	2.4	(7.6)		2.4 - 2.8	2.6	(10.1)		50.0 - 65.0	57.5	(21.5)	
SPAI	2	.139 - .510	.325	(10.8)		3.8 - 7.7	5.8	(18.4)		.6 - 1.1	.8	(3.2)		5.0 - 40.0	22.5	(8.4)	
MUTO	1		.108	(3.6)	93.7		.6	(2.0)	93.9		1.4	(5.3)	96.4		12.5	(4.7)	89.7
MUAR1	1		.048	(1.6)			.9	(3.0)			.1	(.5)			5.0	(1.9)	
BOER1	1		.040	(1.3)			.6	(2.1)			.4	(1.6)			2.5	(.9)	
GUSA	2	.020 - .043	.032	(1.0)		0.0 - 0.0	0.0	(0.0)		.1 - .1	.1	(.3)		5.0 - 10.0	7.5	(2.8)	
ATCA	2	.013 - .043	.028	(.9)		0.0 - .5	.2	(.8)		0.0 - .1	.1	(.2)		0.0 - 10.0	5.0	(1.9)	
ARFE1	1		.015	(.5)			0.0	(0.0)			.2	(.7)			2.5	(.9)	
SPCO	1		.013	(.4)			.0	(0.0)			.1	(.4)			2.5	(.9)	
PSTA	1		.010	(.3)			0.0	(0.0)			.0	(.1)			2.5	(.9)	
OPCL	1		.002	(0.0)			.1	(.2)			0.0	(0.0)			0.0	(0.0)	
			3.001				31.2				25.7						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 37.—Vegetation and soil surface characteristics for plant community 32 (p.c.32).

COMMUNITY 32 : Gusa/Bogr-Hija

SITES 19 52 57 60 62 63 64 157

				Mean[1]							
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
8	21	15.7	0	2.1	13.6	2.6	0.1	83.7	75.8	0.95	29

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	8	.947 - 1.876	1.474	(49.1)		3.9 - 14.6	8.3	(52.9)		9.8 - 99.3	54.0	(71.2)		47.0 - 95.0	77.3	(25.4)	
HIJA	8	.408 - 1.052	.742	(24.7)		1.7 - 5.3	3.6	(23.0)		6.9 - 24.4	14.1	(18.6)		40.0 - 100.0	79.6	(26.2)	
GUSA	8	.101 - .432	.280	(9.3)		.2 - 3.4	1.8	(11.5)		.1 - 3.0	1.6	(2.1)		10.0 - 70.0	44.4	(14.6)	
SPCR	7	0.000 - .418	.126	(4.2)	87.3	0.0 - 1.9	.4	(2.9)	90.3	0.0 - 2.6	1.0	(1.3)	93.2	0.0 - 100.0	30.3	(10.0)	76.2
MUTO	5	0.000 - .287	.073	(2.4)		0.0 - 1.6	.4	(2.5)		0.0 - 9.7	2.4	(3.1)		0.0 - 40.0	9.9	(3.3)	
SIHY	5	0.000 - .133	.055	(1.8)		0.0 - .4	.1	(.7)		0.0 - .7	.3	(.4)		0.0 - 37.0	12.4	(4.1)	
SPAI	6	0.000 - .183	.054	(1.8)		0.0 - .6	.3	(1.9)		0.0 - 2.9	.6	(.7)		0.0 - 27.0	7.0	(2.3)	
ORHY	3	0.000 - .224	.047	(1.6)		0.0 - .6	.1	(.7)		0.0 - 2.2	.4	(.5)		0.0 - 53.0	11.6	(3.8)	
ARLO1	5	0.000 - .119	.036	(1.2)		0.0 - .5	.1	(.6)		0.0 - 1.7	.5	(.6)		0.0 - 27.0	7.9	(2.6)	
STNE	2	0.000 - .118	.021	(.7)		0.0 - .5	.1	(.8)		0.0 - 2.4	.3	(.4)		0.0 - 23.0	3.8	(1.2)	
OPIM	3	0.000 - .080	.013	(.4)		0.0 - 1.0	.2	(1.0)		0.0 - .0	.0	(0.0)		0.0 - 3.0	.4	(.1)	
MUHL	2	0.000 - .049	.012	(.4)		0.0 - .2	.0	(.2)		0.0 - .8	.2	(.2)		0.0 - 10.0	2.5	(.8)	
OPPO	3	0.000 - .041	.011	(.4)		0.0 - .2	.0	(.2)		0.0 - .1	.0	(0.0)		0.0 - 13.0	3.3	(1.1)	
CELA	3	0.000 - .033	.007	(.2)		0.0 - .1	.0	(.1)		0.0 - .1	.0	(0.0)		0.0 - 10.0	2.0	(.7)	
SCPA	1		.006	(.2)			.0	(.1)			.1	(.2)			1.3	(.4)	
AGSM	1		.006	(.2)			.0	(0.0)			.0	(0.0)			1.6	(.5)	
UNKF	2	0.000 - .033	.006	(.2)		0.0 - 0.0	0.0	(0.0)		0.0 - .2	.0	(0.0)		0.0 - 10.0	1.6	(.5)	
ATCA	1		.004	(.1)			.1	(.4)			0.0	(0.0)			0.0	(0.0)	
EULA	1		.004	(.1)			0.0	(0.0)			.0	(.1)			1.3	(.4)	
SPHA	2	0.000 - .017	.004	(.1)		0.0 - 0.0	0.0	(0.0)		0.0 - .1	.0	(0.0)		0.0 - 5.0	1.3	(.4)	
LEER	1		.003	(.1)			0.0	(0.0)			.1	(.1)			.9	(.3)	
EUFE	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.9	(.3)	
CHVI2	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.9	(.3)	
OPCL	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
CLEA	1		.002	(.1)			.0	(.1)			.0	(0.0)			.4	(.1)	
U6012	1		.002	(.1)			0.0	(0.0)			.1	(.1)			.4	(.1)	
CRYP	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
ARTR	1		.002	(0.0)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
SPCO2	1		.001	(0.0)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
HASP	1		.001	(0.0)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
LYPA1	1		.001	(0.0)			0.0	(0.0)			.0	(0.0)			.4	(.1)	
			3.000				15.7				75.8						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 38.—Vegetation and soil surface characteristics for plant community 33 (p.c.33).

COMMUNITY 33 : Gusa/Bogr-Boer

SITES 69

				Mean[1]							
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
1	2	21.0	0	2.3	18.7	0.3	32.3	48.7	46.7	1.37	18

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	1		1.058	(35.2)			7.4	(35.0)			23.9	(51.2)			85.0	(19.5)	
BOER	1		.662	(22.1)			5.3	(25.2)			9.5	(20.3)			90.0	(20.7)	
HIJA	1		.607	(20.2)			4.4	(20.7)			8.5	(18.1)			95.0	(21.8)	
GUSA	1		.196	(6.5)			2.0	(9.3)			.5	(1.1)			40.0	(9.2)	
STNE	1		.192	(6.4)	90.4		1.1	(5.0)	95.2		2.9	(6.1)	96.8		35.0	(8.0)	79.2
ZIGR	1		.065	(2.2)			.2	(.7)			.6	(1.2)			20.0	(4.6)	
ERLA	1		.045	(1.5)			.1	(.5)			.3	(.5)			15.0	(3.4)	
SPCO	1		.028	(.9)			0.0	(0.0)			.3	(.5)			10.0	(2.3)	
SIHY	1		.025	(.8)			0.0	(0.0)			.1	(.2)			10.0	(2.3)	
OPIM	1		.024	(.8)			.3	(1.2)			.1	(.1)			5.0	(1.1)	
ARLO1	1		.024	(.8)			.3	(1.2)			.1	(.1)			5.0	(1.1)	
SPHA	1		.015	(.5)			.1	(.2)			.1	(.1)			5.0	(1.1)	
MUHL	1		.015	(.5)			.1	(.2)			.1	(.1)			5.0	(1.1)	
VEBI	1		.013	(.4)			0.0	(0.0)			.1	(.1)			5.0	(1.1)	
SELO	:		.013	(.4)			0.0	(0.0)			.1	(.1)			5.0	(1.1)	
LYPA1	1		.013	(.4)			0.0	(0.0)			.1	(.1)			5.0	(1.1)	
SCPA	1		.005	(.2)			.1	(.5)			0.0	(0.0)			0.0	(0.0)	
SPCR	1		.002	(.1)			.1	(.2)			0.0	(0.0)			0.0	(0.0)	
			3.002				21.0				46.7						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ⩾ 0.1.

Table 39.—Vegetation and soil surface characteristics for plant community 34 (p.c.34).

COMMUNITY 34 : Bogr-Spai

SITES 131 - Converted

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
1	3	27.2	0.8	3.8	22.6	19.2	0.6	57.6	16.5	2.15	25

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
BOGR	1		.599	(20.0)			6.2	(22.8)			4.6	(27.9)			20.0	(9.2)	
SPAI	1		.411	(13.7)			6.4	(23.4)			.9	(5.5)			27.0	(12.4)	
AGDE	1		.388	(12.9)			3.4	(12.4)			2.1	(12.6)			30.0	(13.8)	
SPCR	1		.343	(11.4)			2.6	(9.6)			2.0	(12.3)			27.0	(12.4)	
AGIN	1		.270	(9.0)			.5	(1.7)			2.6	(16.0)			20.0	(9.2)	
AGSM	1		.193	(6.4)			.3	(1.1)			1.7	(10.5)			17.0	(7.8)	
SIHY	1		.136	(4.5)			.4	(1.4)			.5	(3.0)			20.0	(9.2)	
OPIM	1		.117	(3.9)	81.8		1.6	(6.0)	79.2		.2	(1.0)	88.8		10.0	(4.6)	78.6
AGTR2	1		.089	(3.0)			.5	(1.9)			.9	(5.5)			3.0	(1.4)	
CRUC	1		.062	(2.1)			0.0	(0.0)			.3	(1.6)			10.0	(4.6)	
HYAC	1		.060	(2.0)			.6	(2.1)			.1	(.8)			7.0	(3.2)	
OPPO	1		.044	(1.5)			.7	(2.7)			.0	(.2)			3.0	(1.4)	
SAVE2	1		.041	(1.4)			1.1	(4.1)			0.0	(0.0)			0.0	(0.0)	
MESA	1		.040	(1.3)			.6	(2.0)			.1	(.4)			3.0	(1.4)	
PENS	1		.038	(1.3)			.0	(.1)			.1	(.6)			7.0	(3.2)	
LERE	1		.037	(1.2)			.0	(0.0)			.1	(.6)			7.0	(3.2)	
ORHY	1		.031	(1.0)			.3	(1.2)			.1	(.4)			3.0	(1.4)	
SCPA	1		.028	(.9)			.1	(.2)			.2	(1.0)			3.0	(1.4)	
PIED	1		.019	(.6)			.5	(1.9)			0.0	(0.0)			0.0	(0.0)	
HIJA	1		.016	(.5)			.4	(1.6)			0.0	(0.0)			0.0	(0.0)	
POFE	1		.012	(.4)			.3	(1.2)			0.0	(0.0)			0.0	(0.0)	
JUMO	1		.012	(.4)			.3	(1.2)			0.0	(0.0)			0.0	(0.0)	
CEMO	1		.006	(.2)			.2	(.6)			0.0	(0.0)			0.0	(0.0)	
ARLU	1		.006	(.2)			.2	(.6)			0.0	(0.0)			0.0	(0.0)	
HYRI	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			2.999				27.2				16.5						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 40.—Vegetation and soil surface characteristics for plant community 35 (p.c.35).

COMMUNITY 35 : Gusa/Boer-Hija

SITES 44 105

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
2	6	14.6	0	2.3	12.3	4.5	12.5	70.7	29.4	1.63	23

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	2	.722 - .742	.732	(24.4)		1.3 - 5.1	3.2	(22.0)		5.6 - 14.8	10.2	(34.7)		47.0 - 53.0	50.0	(17.7)	
BOER	2	.386 - .438	.412	(27.5)		.8 - 2.7	1.8	(24.4)		3.4 - 6.2	4.8	(32.6)		26.5 - 40.0	33.3	(23.6)	
SPAI	1		.273	(9.1)			.7	(4.6)			1.8	(6.2)			15.0	(5.3)	
GUSA	2	.056 - .332	.194	(6.5)		.1 - 2.9	1.5	(10.4)		.1 - 1.4	.8	(2.6)		7.0 - 60.0	33.5	(11.9)	
STNE	1		.138	(4.6)			.9	(5.9)			2.1	(7.2)			16.5	(5.9)	
SPCR	2	.113 - .143	.128	(4.3)		.2 - .8	.5	(3.3)		.4 - .9	.6	(2.2)		20.0 - 20.0	20.0	(7.1)	
BOGR	1		.121	(4.0)			1.5	(10.5)			1.4	(4.7)			6.5	(2.3)	
ATCA	2	.013 - .195	.104	(3.5)		.3 - 1.2	.7	(5.1)		0.0 - .0	.0	(.1)		0.0 - 3.0	1.5	(.5)	
UNKF	1		.102	(3.4)	87.3		.1	(.6)	86.8		.6	(2.1)	92.4		11.5	(4.1)	78.4
ARLO1	2	.057 - .129	.093	(3.1)		.2 - .7	.5	(3.1)		.2 - 1.7	1.0	(3.2)		3.0 - 20.0	11.5	(4.1)	
MUPO1	1		.064	(2.1)			.9	(6.1)			.4	(1.4)			5.0	(1.8)	
SPCO	2	.043 - .060	.052	(1.7)		.1 - .2	.1	(.9)		.0 - .4	.2	(.7)		3.0 - 17.0	10.0	(3.5)	
SIHY	1		.030	(1.0)			.1	(.3)			.2	(.5)			8.5	(3.0)	
ASIT	1		.026	(.9)			.1	(.6)			.1	(.4)			6.5	(2.3)	
ASTR	2	.023 - .026	.025	(.8)		0.0 - .1	.1	(.4)		.1 - .1	.1	(.3)		3.0 - 7.0	5.0	(1.8)	
HASP2	1		.022	(.7)			.1	(.6)			.0	(.1)			1.5	(.5)	
TRPU	1		.021	(.7)			.0	(.1)			.1	(.2)			3.5	(1.2)	
LEER	1		.018	(.6)			.1	(.3)			.2	(.8)			3.5	(1.2)	
SOLA	1		.009	(.3)			0.0	(0.0)			.0	(.1)			1.5	(.5)	
SENE	1		.009	(.3)			0.0	(0.0)			.0	(.1)			1.5	(.5)	
SPNE1	1		.008	(.3)			.1	(.3)			0.0	(0.0)			0.0	(0.0)	
LYPA1	1		.006	(.2)			.0	(.1)			.0	(.1)			1.5	(.5)	
ARTE	1		.006	(.2)			.0	(.1)			.0	(.1)			1.5	(.5)	
CHNA	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				14.6				29.4						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 41.—Vegetation and soil surface characteristics for plant community 36 (p.c.36).

COMMUNITY 36 : Gusa/Hija-Bogr

SITES	No. Sites	No. Trans.	C[1]	TC[1]	SC[1]	HC[1]	L[1]	R[1]	BS[1,2]	D[1]	d[1]	SR[1]
27 32 61 84 137 148	6	16	13.8	0	3.4	10.4	5.7	4.7	79.2	33.4	1.25	35

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	6	.922 - 1.650	1.205	(40.2)		1.8 - 8.2	5.0	(36.3)		6.6 - 31.3	15.6	(46.9)		65.0 - 100.0	83.0	(32.9)	
BOGR	6	.137 - .838	.658	(22.0)		.6 - 4.9	2.9	(21.2)		.9 - 28.5	10.8	(32.3)		10.0 - 55.0	39.7	(15.7)	
GUSA	6	.103 - 1.098	.402	(13.4)		.3 - 7.8	2.5	(18.0)		.1 - 5.9	2.3	(6.8)		10.0 - 70.0	40.5	(16.1)	
MUTO	4	0.000 - .392	.124	(4.1)		0.0 - 2.9	.8	(5.9)		0.0 - 5.7	1.3	(4.0)		0.0 - 30.0	10.3	(4.1)	
SPAI	5	0.000 - .253	.104	(3.5)	83.2	0.0 - 2.0	.6	(4.7)	86.1	0.0 - 2.5	.7	(2.2)	92.2	0.0 - 18.0	7.0	(2.8)	71.6
SPCR	3	0.000 - .215	.072	(2.4)		0.0 - .3	.1	(.6)		0.0 - 3.2	.8	(2.4)		0.0 - 53.0	14.3	(5.7)	
ARLO1	2	0.000 - .384	.066	(2.2)		0.0 - 1.4	.2	(1.7)		0.0 - 3.7	.6	(1.9)		0.0 - 50.0	8.8	(3.5)	
ATCA	4	0.000 - .126	.053	(1.8)		0.0 - 1.1	.5	(3.4)		0.0 - .2	.0	(.1)		0.0 - 13.0	3.3	(1.3)	
SIHY	4	0.000 - .117	.042	(1.4)		0.0 - .5	.1	(.5)		0.0 - .9	.2	(.7)		0.0 - 18.0	8.5	(3.4)	
ORHY	4	0.000 - .176	.036	(1.2)		0.0 - 1.0	.2	(1.2)		0.0 - 1.0	.2	(.6)		0.0 - 25.0	5.7	(2.2)	
STNE	1		.024	(.8)			.0	(.1)			.1	(.4)			2.2	(.9)	
ARBI2	1		.020	(.7)			.0	(.2)			.0	(.1)			2.2	(.9)	
EPHE	1		.020	(.7)			.1	(.6)			.0	(0.0)			.5	(.2)	
ATCO	2	0.000 - .097	.020	(.7)		0.0 - 1.1	.2	(1.7)		0.0 - .1	.0	(0.0)		0.0 - 8.0	1.3	(.5)	
LEER	2	0.000 - .064	.019	(.6)		0.0 - 0.0	0.0	(0.0)		0.0 - .3	.1	(.2)		0.0 - 13.0	3.8	(1.5)	
EULA	3	0.000 - .063	.019	(.6)		0.0 - .3	.1	(.6)		0.0 - .6	.1	(.4)		0.0 - 17.0	3.8	(1.5)	
AGSM	2	0.000 - .067	.016	(.5)		0.0 - .2	.1	(.5)		0.0 - .2	.1	(.1)		0.0 - 17.0	3.3	(1.3)	
EULA1	1		.013	(.4)			0.0	(0.0)			.0	(.1)			2.2	(.9)	
STCO1	1		.009	(.3)			.0	(.3)			.1	(.2)			1.3	(.5)	
FRJA	1		.008	(.3)			.0	(.2)			.0	(0.0)			.5	(.2)	
OPPO	1		.008	(.3)			.0	(.3)			.0	(0.0)			.8	(.3)	
OPCL	1		.007	(.2)			.0	(0.0)			.1	(.1)			2.2	(.9)	
BOCU	1		.007	(.2)			0.0	(0.0)			.1	(.2)			.5	(.2)	
GRIN	1		.005	(.2)			.0	(.1)			.0	(0.0)			.8	(.3)	
ERIO1	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
CHNA	1		.005	(.2)			.0	(.3)			.0	(0.0)			.5	(.2)	
TAPA1	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
SPHA	1		.005	(.2)			0.0	(0.0)			.0	(0.0)			.8	(.3)	
CELA	1		.005	(.2)			.1	(.6)			0.0	(0.0)			0.0	(0.0)	
OPUN	1		.004	(.1)			.0	(.2)			.0	(0.0)			.5	(.2)	
MUSQ	1		.003	(.1)			.0	(.1)			.0	(.1)			.5	(.2)	
ARTR	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
UFORB	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
EUFE	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
DAFO	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.5	(.2)	
YUAN	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
JUMO	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			2.998				13.8				33.4						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ⩾ 0.1.*

Table 42.—Vegetation and soil surface characteristics for plant community 37 (p.c.37).

COMMUNITY 37 : Hija-Spai

SITES 24 31 43 45 93

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
5	17	13.5	0	0.2	13.3	3.3	0.1	83.3	66.3	1.03	21

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	5	1.323 - 2.005	1.621	(54.0)		4.4 - 10.4	7.5	(56.0)		12.5 - 143.7	47.3	(71.4)		67.0 - 100.0	80.4	(42.6)	
SPAI	5	.426 - .950	.710	(23.7)		2.9 - 6.0	4.1	(30.2)		3.0 - 36.1	12.1	(18.3)		23.0 - 66.0	42.0	(22.2)	
SPCR	4	0.000 - .504	.262	(8.7)		0.0 - 1.0	.6	(4.2)		0.0 - 4.3	2.0	(3.1)		0.0 - 60.0	29.6	(15.7)	
BOGR	4	0.000 - .435	.229	(7.6)	94.0	0.0 - 2.4	.9	(6.3)	96.7	0.0 - 6.3	3.6	(5.5)	98.3	0.0 - 30.0	13.4	(7.1)	87.6
ORHY	1		.033	(1.1)			.1	(.5)			.1	(.2)			5.0	(2.6)	
GUSA	3	0.000 - .058	.031	(1.0)		0.0 - .3	.1	(.8)		0.0 - .1	.1	(.1)		0.0 - 8.0	4.6	(2.4)	
ARLO1	2	0.000 - .078	.024	(.8)		0.0 - .2	.0	(.3)		0.0 - .4	.2	(.2)		0.0 - 13.0	3.2	(1.7)	
MUTO	1		.014	(.5)			.0	(.1)			.5	(.7)			.6	(.3)	
EUPH	1		.014	(.5)			.0	(0.0)			.1	(.1)			2.0	(1.1)	
CELA	1		.012	(.4)			.1	(.4)			.0	(0.0)			1.6	(.8)	
ARTR	2	0.000 - .031	.011	(.4)		0.0 - .2	.0	(.3)		0.0 - .5	.1	(.2)		0.0 - 3.0	1.2	(.6)	
SCPA	2	0.000 - .020	.008	(.3)		0.0 - 0.0	0.0	(0.0)		0.0 - .2	.0	(.1)		0.0 - 3.0	1.2	(.6)	
SAKA	1		.007	(.2)			.0	(0.0)			.0	(0.0)			1.0	(.5)	
SIHY	1		.005	(.2)			.0	(.1)			.0	(0.0)			.6	(.3)	
ATOB	1		.004	(.1)			0.0	(0.0)			.1	(.1)			.6	(.3)	
ASTR	1		.004	(.1)			0.0	(0.0)			.0	(0.0)			.6	(.3)	
ATCO	1		.003	(.1)			0.0	(0.0)			.0	(0.0)			.6	(.3)	
SPCO	1		.002	(.1)			0.0	(0.0)			.0	(0.0)			.6	(.3)	
OPIM	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
ATCA	1		.002	(.1)			.0	(.3)			0.0	(0.0)			0.0	(0.0)	
OPCL	1		.002	(.1)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				13.5				66.3						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 43.—Vegetation and soil surface characteristics for plant community 38 (p.c.38).

COMMUNITY 38 : Gusa/Hija-Spcr

SITES 58

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
1	3	10.1	0	3.8	6.3	5.2	0	88.5	37.5	1.41	11

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
HIJA	1		1.079	(36.0)			2.9	(28.7)			18.6	(49.6)			87.0	(29.8)	
GUSA	1		.685	(22.8)			3.7	(36.7)			3.0	(8.0)			70.0	(24.0)	
SPCR	1		.565	(18.8)			.9	(9.2)			7.5	(20.0)			80.0	(27.4)	
BOGR	1		.405	(13.5)			1.8	(17.8)			6.0	(15.9)			20.0	(6.8)	
SPAI	1		.103	(3.4)	94.5		.5	(5.3)	97.7		1.5	(3.9)	97.4		3.0	(1.0)	89.0
ORHY	1		.064	(2.1)			.0	(.3)			.6	(1.5)			13.0	(4.5)	
AGSM	1		.049	(1.6)			.1	(.7)			.3	(.8)			10.0	(3.4)	
ATCA	1		.012	(.4)			0.0	(0.0)			.0	(.1)			3.0	(1.0)	
ARLO1	1		.012	(.4)			0.0	(0.0)			.0	(.1)			3.0	(1.0)	
ARLO	1		.012	(.4)			0.0	(0.0)			.0	(.1)			3.0	(1.0)	
OPPO	1		.010	(.3)			.1	(1.0)			0.0	(0.0)			0.0	(0.0)	
LEER	1		.003	(.1)			.0	(.3)			0.0	(0.0)			0.0	(0.0)	
			2.999				10.1				37.5						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 44.—Vegetation and soil surface characteristics for plant community 39 (p.c.39).

COMMUNITY 39 : Spai

SITES 54

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	5	15.1	0	0.3	14.8	2.2	0	83.0	57.5	0.19	7

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPAI	1		2.816	(93.9)			14.2	(94.4)			55.3	(96.3)			100.0	(90.9)	
BOGR	1		.084	(2.8)			.4	(2.5)			1.3	(2.3)			4.0	(3.6)	
ARCA	1		.056	(1.9)			.2	(1.6)			.2	(.4)			4.0	(3.6)	
HIJA	1		.034	(1.1)			.1	(.5)			.6	(1.0)			2.0	(1.8)	
ATCA	1		.005	(.2)			.1	(.5)			0.0	(0.0)			0.0	(0.0)	
SIHY	1		.003	(.1)			.0	(.3)			0.0	(0.0)			0.0	(0.0)	
GUSA	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			2.999				15.1				57.5						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ⩾ 0.1.*

Table 45.—Vegetation and soil surface characteristics for plant community 40 (p.c.40).

COMMUNITY 40 : Spai-Bogr

SITES 53 86 149 154 155

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
5	7	24.7	0	1.7	23.0	5.1	0	71.9	26.5	1.07	23

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPAI	5	.291 - 2.059	1.302	(43.4)		1.8 - 44.3	14.7	(59.5)		2.8 - 26.5	10.2	(38.7)		20.0 - 100.0	73.4	(36.4)	
BOGR	5	.157 - .997	.697	(23.2)		2.3 - 5.8	3.6	(14.6)		.3 - 12.8	8.8	(33.3)		10.0 - 60.0	37.4	(18.6)	
SPCR	4	0.000 - 1.438	.449	(15.0)		0.0 - 12.7	2.9	(11.8)		0.0 - 10.7	3.2	(12.2)		0.0 - 90.0	38.0	(18.8)	
HIJA	4	0.000 - .607	.171	(5.7)	87.3	0.0 - 2.6	.6	(2.6)	88.5	0.0 - 7.8	2.3	(8.6)	92.8	0.0 - 50.0	13.4	(6.6)	80.4
MURI1	1		.092	(3.1)			.4	(1.5)			1.3	(4.8)			4.0	(2.0)	
SIHY	2	0.000 - .293	.067	(2.2)		0.0 - 1.0	.2	(.9)		0.0 - .8	.2	(.6)		0.0 - 60.0	12.0	(6.0)	
OPIM	3	0.000 - .093	.048	(1.6)		0.0 - .8	.2	(.6)		0.0 - .3	.1	(.4)		0.0 - 20.0	8.0	(4.0)	
OPPO	2	0.000 - .121	.030	(1.0)		0.0 - 1.5	.4	(1.8)		0.0 - .5	.1	(.4)		0.0 - 10.0	2.0	(1.0)	
LYPA	1		.018	(.6)			.2	(.7)			.0	(.2)			2.0	(1.0)	
SAVE2	2	0.000 - .061	.016	(.5)		0.0 - 1.4	.4	(1.4)		0.0 - 0.0	0.0	(0.0)		0.0 - 0.0	0.0	(0.0)	
ATCA	2	0.000 - .046	.015	(.5)		0.0 - .4	.1	(.3)		0.0 - .1	.0	(.1)		0.0 - 10.0	2.0	(1.0)	
ATOB	1		.013	(.4)			.2	(.7)			0.0	(0.0)			0.0	(0.0)	
SAKA	1		.012	(.4)			.0	(.1)			.1	(.3)			1.4	(.7)	
GUSA	1		.012	(.4)			.0	(.2)			.0	(.1)			2.0	(1.0)	
EPTO	1		.011	(.4)			.2	(.6)			0.0	(0.0)			0.0	(0.0)	
SPHA	1		.010	(.3)			.0	(0.0)			.0	(.2)			2.0	(1.0)	
HASP	1		.010	(.3)			0.0	(0.0)			.0	(.2)			2.0	(1.0)	
SPCO	2	0.000 - .046	.010	(.3)		0.0 - .1	.0	(.1)		0.0 - .1	.0	(.1)		0.0 - 10.0	2.0	(1.0)	
SCPA	1		.006	(.2)			.1	(.5)			0.0	(0.0)			0.0	(0.0)	
CLSE	1		.004	(.1)			.2	(.9)			0.0	(0.0)			0.0	(0.0)	
SPOR	1		.004	(.1)			.2	(.8)			0.0	(0.0)			0.0	(0.0)	
BACC	1		.001	(0.0)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
ARBI2	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.000				24.7				26.5						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*
[2]*BS = 100 - (HC + L + R).*
[3]*Plant species symbol (see Appendix B for full nomenclature).*
[4]*K = Constancy.*
[5]*TP = Total percent for species with IV ⩾ 0.1.*

Table 46.—Vegetation and soil surface characteristics for plant community 41 (p.c.41).

COMMUNITY 41 : Spai-Hija

SITES 28 29 33 67

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
4	13	24.3	0	0.5	23.8	8.0	0	68.2	26.8	1.13	19

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPAI	4	1.514 - 1.937	1.661	(55.4)		9.9 - 23.6	18.2	(74.9)		11.9 - 15.6	13.2	(49.4)		38.0 - 85.0	65.0	(40.8)	
HIJA	4	.377 - 1.049	.753	(25.1)		1.6 - 6.6	4.1	(16.9)		5.5 - 11.5	8.4	(31.1)		30.0 - 50.0	40.3	(25.2)	
MUTO	2	0.000 - .352	.105	(3.5)	84.0	0.0 - 1.5	.4	(1.5)	93.3	0.0 - 7.0	1.9	(7.1)	87.6	0.0 - 17.0	5.5	(3.4)	69.4
SCPA	3	0.000 - .235	.096	(3.2)		0.0 - .3	.1	(.5)		0.0 - 2.1	.7	(2.5)		0.0 - 28.0	11.5	(7.2)	
BOGR	3	0.000 - .220	.091	(3.0)		0.0 - 1.0	.5	(1.9)		0.0 - 4.4	1.4	(5.3)		0.0 - 10.0	3.8	(2.4)	
SPCR	3	0.000 - .214	.090	(3.0)		0.0 - .8	.3	(1.2)		0.0 - 2.2	.8	(2.8)		0.0 - 23.0	10.3	(6.4)	
SIHY	2	0.000 - .174	.059	(2.0)		0.0 - .4	.1	(.5)		0.0 - .3	.1	(.4)		0.0 - 15.0	6.3	(3.9)	
GUSA	3	0.000 - .077	.045	(1.5)		0.0 - .9	.3	(1.4)		0.0 - .2	.1	(.3)		0.0 - 7.0	4.3	(2.7)	
AGSM	2	0.000 - .117	.030	(1.0)		0.0 - .0	.0	(0.0)		0.0 - .5	.1	(.5)		0.0 - 20.0	5.0	(3.1)	
ORHY	3	0.000 - .054	.022	(.7)		0.0 - .1	.0	(.2)		0.0 - .1	.0	(.1)		0.0 - 5.0	2.8	(1.7)	
AGTR	1		.009	(.3)			.0	(0.0)			.1	(.2)			1.3	(.8)	
OPCL	1		.008	(.3)			.0	(.1)			.0	(.1)			.8	(.5)	
OPIM	1		.007	(.2)			.1	(.4)			0.0	(0.0)			0.0	(0.0)	
ARTR	1		.007	(.2)			.1	(.2)			.0	(.1)			.8	(.5)	
OPPO	1		.006	(.2)			0.0	(0.0)			.0	(0.0)			.8	(.5)	
ATCA	2	0.000 - .018	.006	(.2)		0.0 - .1	.0	(.1)		0.0 - .0	.0	(0.0)		0.0 - 3.0	.8	(.5)	
SAVE2	1		.005	(.2)			0.0	(0.0)			.0	(.1)			.8	(.5)	
CRYP	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
BACC	1		.001	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			2.999				24.3				26.8						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 47.—Vegetation and soil surface characteristics for plant community 42 (p.c.42).

COMMUNITY 42 : Gusa/Spai-Hija

SITES 109 156

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
2	6	8.6	0	3.8	4.8	5.3	2.3	87.6	14.8	1.62	22

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPAI	2	.537 - .966	.752	(25.1)		1.1 - 4.3	2.7	(31.4)		3.7 - 4.8	4.2	(28.3)		23.0 - 45.0	34.0	(16.5)	
GUSA	2	.717 - .726	.722	(24.1)		2.3 - 2.4	2.3	(27.4)		1.8 - 2.5	2.1	(14.4)		55.0 - 65.0	60.0	(29.2)	
HIJA	2	.509 - .872	.691	(23.0)		.9 - 1.5	1.2	(14.2)		3.5 - 6.4	4.9	(33.2)		38.0 - 45.0	41.5	(20.2)	
BOGR	2	.072 - .315	.194	(6.5)	78.7	.1 - .5	.3	(3.1)	76.1	.2 - 2.8	1.5	(10.0)	85.9	10.0 - 18.0	14.0	(6.8)	72.7
OPUN	1		.092	(3.1)			.4	(4.3)			.3	(1.7)			6.5	(3.2)	
BOER1	2	.001 - .182	.092	(3.1)		.0 - .2	.1	(1.1)		0.0 - 1.6	.8	(5.5)		0.0 - 13.0	6.5	(3.2)	
ARTR	1		.088	(2.9)			.4	(4.9)			.1	(.5)			6.5	(3.2)	
ORHY	2	.034 - .099	.067	(2.2)		.0 - .3	.1	(1.5)		.1 - .5	.3	(2.0)		5.0 - 8.0	6.5	(3.2)	
SPCR	2	.018 - .096	.057	(1.9)		0.0 - 0.0	0.0	(0.0)		.1 - .3	.2	(1.2)		3.0 - 15.0	9.0	(4.4)	
OPCL	1		.049	(1.6)			.3	(3.5)			.1	(.3)			2.5	(1.2)	
ATCA	1		.042	(1.4)			.2	(2.5)			.0	(.3)			2.5	(1.2)	
ARDI2	1		.034	(1.1)			.1	(1.3)			.1	(.8)			2.5	(1.2)	
SIHY	2	.026 - .034	.030	(1.0)		.0 - .0	.0	(.3)		.1 - .2	.1	(.9)		3.0 - 5.0	4.0	(1.9)	
SPCO	1		.020	(.7)			.1	(.6)			.0	(.2)			2.5	(1.2)	
JUMO	1		.016	(.5)			.1	(1.5)			0.0	(0.0)			0.0	(0.0)	
TAPA1	1		.016	(.5)			.0	(.1)			.0	(.2)			2.5	(1.2)	
TETR	1		.009	(.3)			.0	(.2)			.0	(.1)			1.5	(.7)	
OPPO	1		.008	(.3)			.1	(.9)			0.0	(0.0)			0.0	(0.0)	
MUTO	1		.008	(.3)			.1	(.9)			0.0	(0.0)			0.0	(0.0)	
EULA	1		.008	(.3)			0.0	(0.0)			.0	(.2)			1.5	(.7)	
YUGL	1		.007	(.2)			0.0	(0.0)			.0	(.1)			1.5	(.7)	
ARFE1	1		.004	(.1)			.0	(.4)			0.0	(0.0)			0.0	(0.0)	
			3.000				8.6				14.8						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 48.—Vegetation and soil surface characteristics for plant community 43 (p.c.43).

COMMUNITY 43 : Spai-Agsm

SITES 34 76

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
2	7	28.2	0	1.1	27.1	8.0	0	64.9	53.7	1.38	20

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPAI	2	.701 - 1.984	1.343	(44.7)		6.9 - 29.5	18.2	(64.6)		12.7 - 14.4	13.6	(25.2)		68.0 - 73.0	70.5	(31.2)	
AGSM	2	.329 - .697	.513	(17.1)		1.9 - 4.1	3.0	(10.7)		2.5 - 23.3	12.9	(24.0)		23.0 - 73.0	48.0	(21.2)	
BOGR	1		.306	(10.2)			2.1	(7.3)			14.3	(26.7)			15.0	(6.6)	
SPCR	2	.078 - .345	.212	(7.0)		.3 - .4	.4	(1.3)		.5 - 2.8	1.6	(3.1)		18.0 - 30.0	24.0	(10.6)	
MURI1	1		.179	(6.0)			1.5	(5.3)			5.8	(10.7)			14.0	(6.2)	
HIJA	2	.006 - .210	.108	(3.6)	88.6	.2 - 2.1	1.1	(4.0)	93.2	0.0 - 6.6	3.3	(6.1)	95.8	0.0 - 13.0	6.5	(2.9)	78.7
SCPA	1		.088	(2.9)			.4	(1.6)			1.1	(2.0)			16.5	(7.3)	
GUSA	2	.018 - .116	.067	(2.2)		0.0 - .6	.3	(1.1)		.1 - .3	.2	(.3)		5.0 - 13.0	9.0	(4.0)	
SIHY	2	.024 - .048	.036	(1.2)		.0 - .2	.1	(.4)		.0 - .4	.2	(.4)		3.0 - 10.0	6.5	(2.9)	
SPIN	1		.035	(1.2)			0.0	(0.0)			.5	(.9)			1.5	(.7)	
CHVI3	1		.028	(.9)			.5	(1.9)			.0	(0.0)			1.5	(.7)	
AGCR	1		.020	(.7)			.2	(.7)			.1	(.2)			1.5	(.7)	
ATCA	1		.018	(.6)			.2	(.8)			.0	(0.0)			1.5	(.7)	
SPHA	1		.014	(.5)			.0	(0.0)			.1	(.1)			4.0	(1.8)	
UKDIC	1		.012	(.4)			0.0	(0.0)			.0	(.1)			1.5	(.7)	
ALCE	1		.012	(.4)			0.0	(0.0)			.0	(0.0)			1.5	(.7)	
MACH	1		.005	(.2)			0.0	(0.0)			.1	(.1)			1.5	(.7)	
LEER	1		.005	(.1)			0.0	(0.0)			.0	(0.0)			1.5	(.7)	
OPPO	1		.002	(0.0)			.1	(.2)			0.0	(0.0)			0.0	(0.0)	
MUTO	1		.002	(0.0)			.0	(.1)			0.0	(0.0)			0.0	(0.0)	
			3.001				28.2				53.7						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 49.—Vegetation and soil surface characteristics for plant community 44 (p.c.44).

COMMUNITY 44 : Spne-Boer

SITES 39

		Mean[1]									
No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
1	2	8.1	0	0.4	8.7	2.5	0	88.8	8.8	1.83	16

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SPNE1	1		.777	(25.9)			2.5	(30.2)			2.4	(27.4)			40.0	(20.0)	
LEPT	1		.760	(25.3)			2.7	(32.7)			1.6	(18.3)			50.0	(25.0)	
BOER1	1		.401	(13.4)			1.1	(13.0)			1.5	(17.1)			20.0	(10.0)	
HIJA	1		.371	(12.4)			.3	(3.1)			2.1	(24.0)			20.0	(10.0)	
EPTO	1		.173	(5.8)			.9	(11.1)			.1	(1.1)			10.0	(5.0)	
CELA	1		.152	(5.1)	87.9		.3	(3.7)	93.8		.4	(4.0)	91.9		15.0	(7.5)	77.5
PSTA	1		.067	(2.2)			0.0	(0.0)			.2	(1.7)			10.0	(5.0)	
GUSA	1		.061	(2.0)			0.0	(0.0)			.1	(1.1)			10.0	(5.0)	
BOGR	1		.054	(1.8)			0.0	(0.0)			.3	(2.9)			5.0	(2.5)	
LYPA1	1		.043	(1.4)			.1	(1.2)			.1	(.6)			5.0	(2.5)	
MUHL	1		.037	(1.2)			.1	(.6)			.1	(.6)			5.0	(2.5)	
SPCR	1		.031	(1.0)			0.0	(0.0)			.1	(.6)			5.0	(2.5)	
COVI	1		.031	(1.0)			0.0	(0.0)			.1	(.6)			5.0	(2.5)	
SPCO	1		.025	(.8)			.2	(2.5)			0.0	(0.0)			0.0	(0.0)	
ARLO1	1		.012	(.4)			.1	(1.2)			0.0	(0.0)			0.0	(0.0)	
LEER	1		.006	(.2)			.1	(.6)			0.0	(0.0)			0.0	(0.0)	
			3.001				8.1				8.8						

[1]C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.
[2]BS = 100 - (HC + L + R).
[3]Plant species symbol (see Appendix B for full nomenclature).
[4]K = Constancy.
[5]TP = Total percent for species with IV ≥ 0.1.

Table 50.—Vegetation and soil surface characteristics for plant community 45 (p.c.45).

COMMUNITY 45 : Scbr-Bogr

SITES 41

No. Sites	No. Trans.	C	TC	SC	HC	L	R	BS[2]	D	d	SR
		Mean[1]									
1	3	14.9	0	0.2	14.7	1.1	0	84.2	55.6	1.35	13

		IMPORTANCE VALUE				PERCENT COVER				DENSITY				PERCENT FREQUENCY			
SPECIES[3]	K[4]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]	RANGE	MEAN	% TOTAL	TP[5]
SCBR	1		1.037	(34.6)			5.9	(39.5)			21.7	(39.0)			63.0	(25.4)	
BOGR	1		1.004	(33.5)			5.5	(37.0)			21.2	(38.1)			63.0	(25.4)	
SPCR	1		.499	(16.6)			1.7	(11.6)			7.2	(12.9)			63.0	(25.4)	
HIJA	1		.193	(6.4)			.9	(6.1)			2.9	(5.3)			20.0	(8.1)	
SPAI	1		.130	(4.3)	95.4		.6	(3.8)	98.6		1.4	(2.5)	97.8		17.0	(6.9)	91.2
MUHL	1		.033	(1.1)			0.0	(0.0)			1.1	(1.9)			3.0	(1.2)	
LESQ	1		.028	(.9)			0.0	(0.0)			.1	(.1)			7.0	(2.8)	
OPIM	1		.018	(.6)			.1	(.5)			.0	(.1)			3.0	(1.2)	
SPCO	1		.016	(.5)			.0	(.2)			.0	(.1)			3.0	(1.2)	
HASP2	1		.014	(.5)			0.0	(0.0)			.0	(.1)			3.0	(1.2)	
CELA	1		.014	(.5)			0.0	(0.0)			.0	(.1)			3.0	(1.2)	
OPCL	1		.011	(.4)			.2	(1.1)			0.0	(0.0)			0.0	(0.0)	
SOLA	1		.002	(.1)			.0	(.2)			0.0	(0.0)			0.0	(0.0)	
			2.999				14.9				55.6						

[1]*C = Total % plant cover, TC = % tree cover, SC = % shrub cover, HC = % herbaceous plant cover, L = % litter, R = % rock, BS = % bare soil, D = Density, d = Diversity, SR = Species richness.*

[2]*BS = 100 - (HC + L + R).*

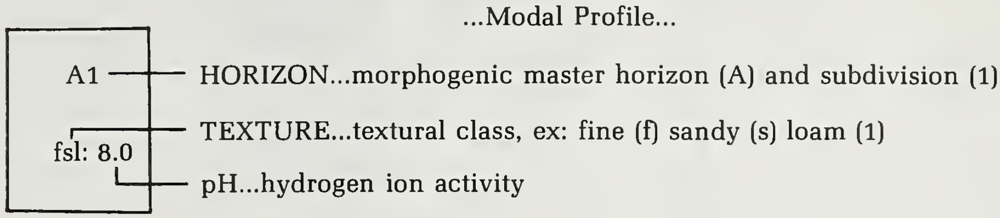
[3]*Plant species symbol (see Appendix B for full nomenclature).*

[4]*K = Constancy.*

[5]*TP = Total percent for species with IV ⩾ 0.1.*

APPENDIX A

Modal soil profiles of the Upper Rio Puerco Watershed. Soil orders, series, associations, and complexes adapted from Folks and Stone (1968), and an unpublished survey[5]. Horizon and texture designations follow soil taxonomy nomenclature (Soil Survey Staff 1975).



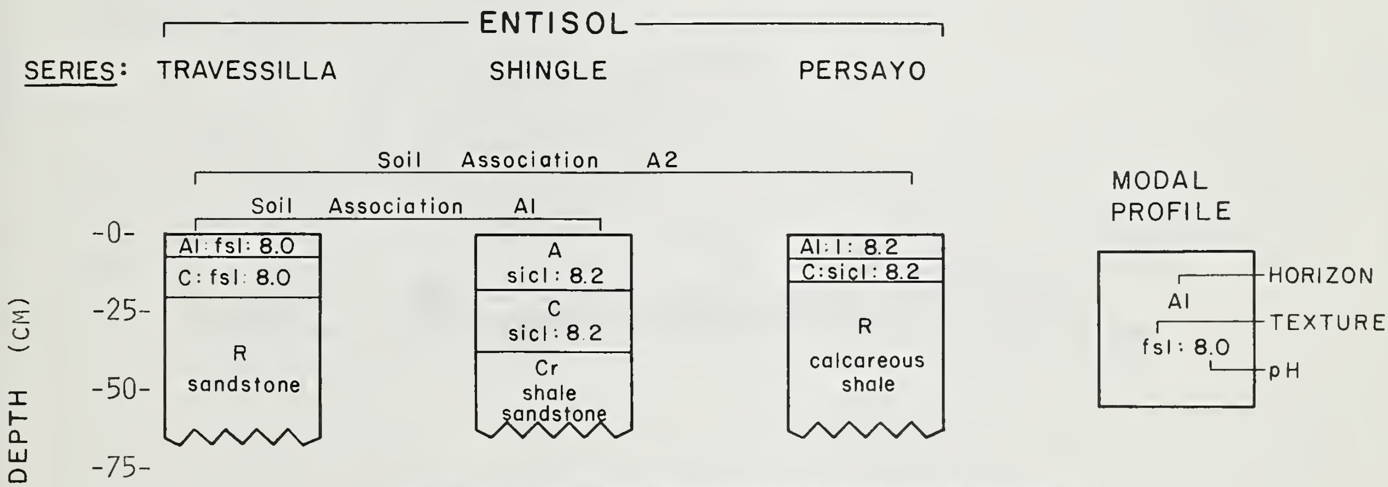


Figure A1.—Modal profiles of three soil series in the Entisol order; includes soil associations A1 and A2.

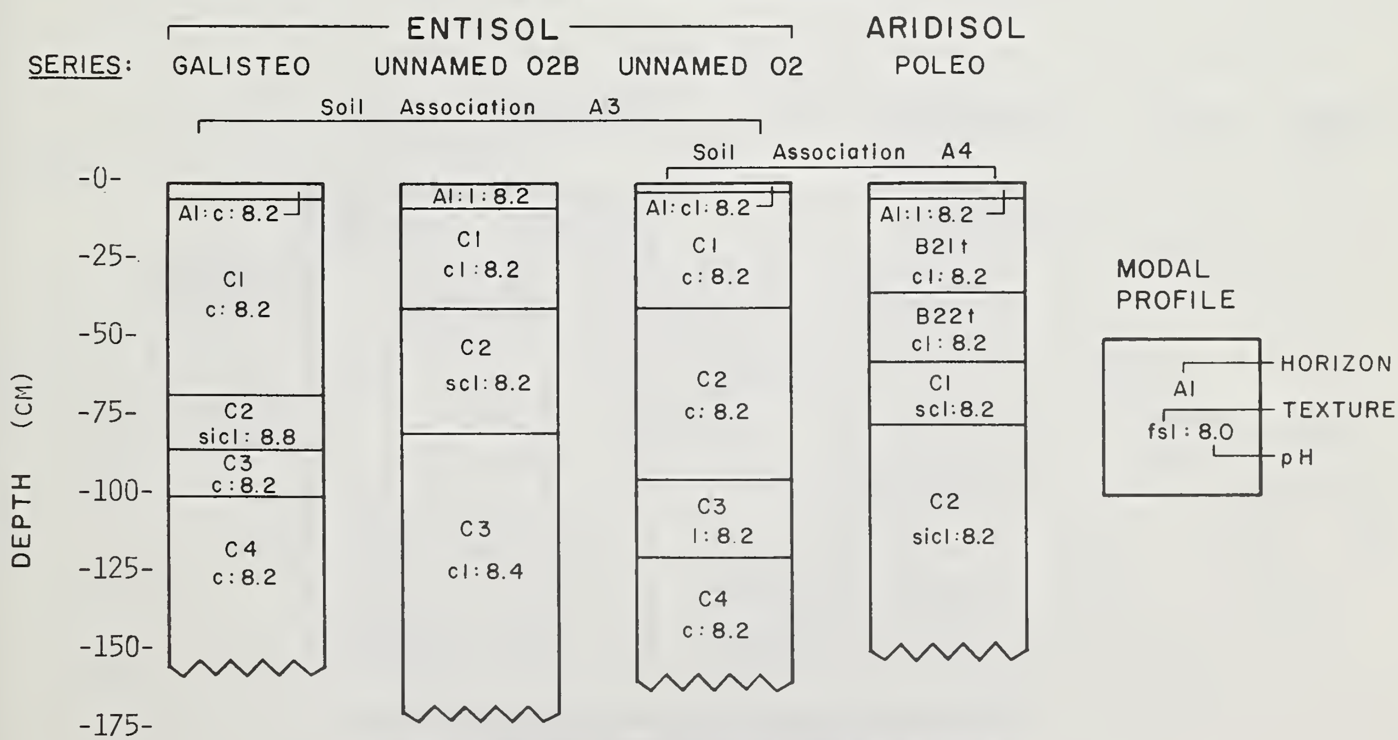


Figure A2.—Modal profiles of four soil series in the Entisol and Aridisol orders; includes soil associations A3 and A4.

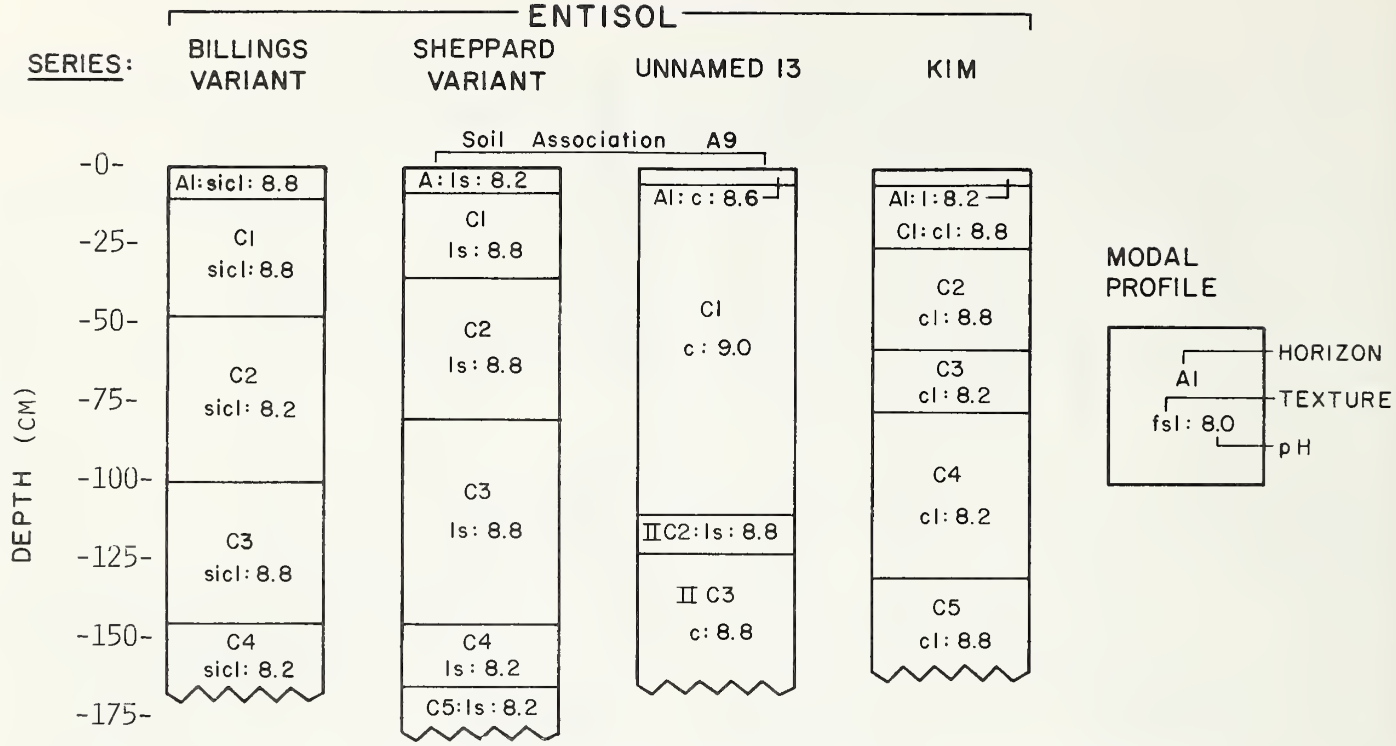


Figure A3.—Modal profiles of four soil series in the Entisol order; includes soil association A9.

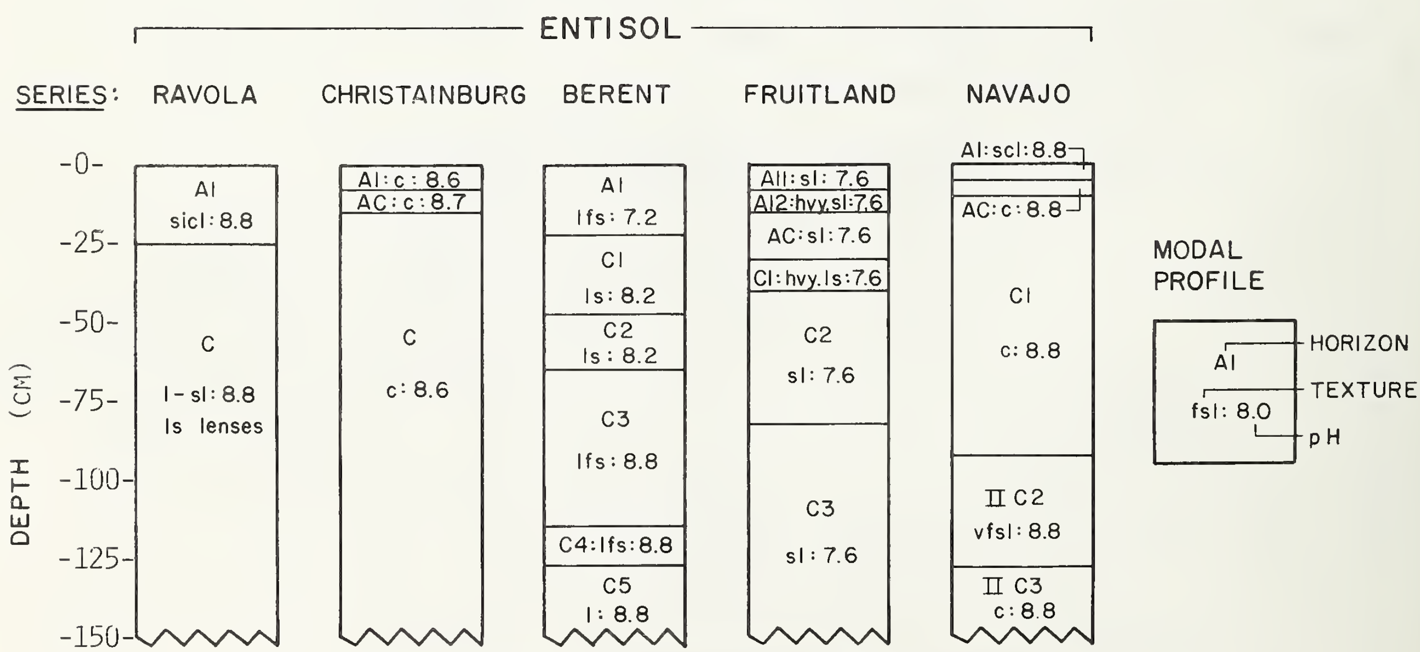


Figure A4.—Modal profiles of five soil series in the Entisol order.

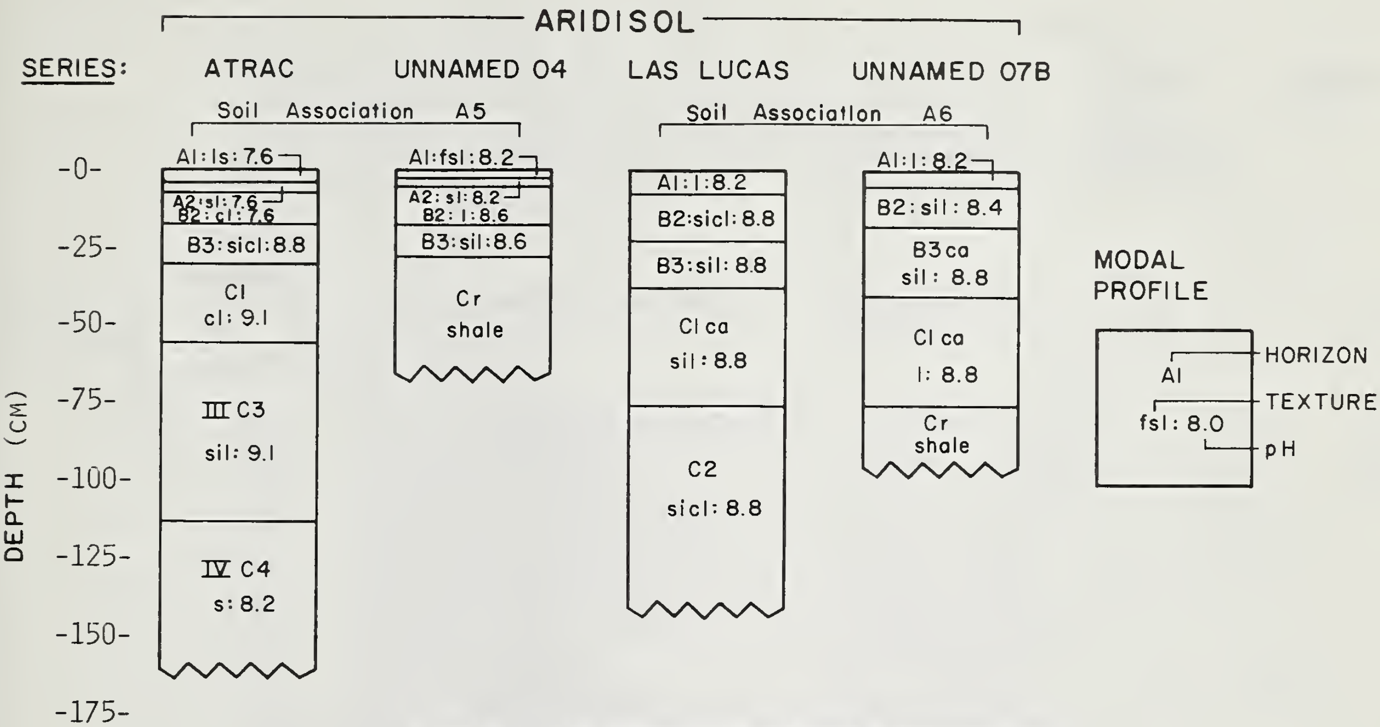


Figure A5.—Modal profiles of four soil series in the Aridisol order; includes soil associations A5 and A6.

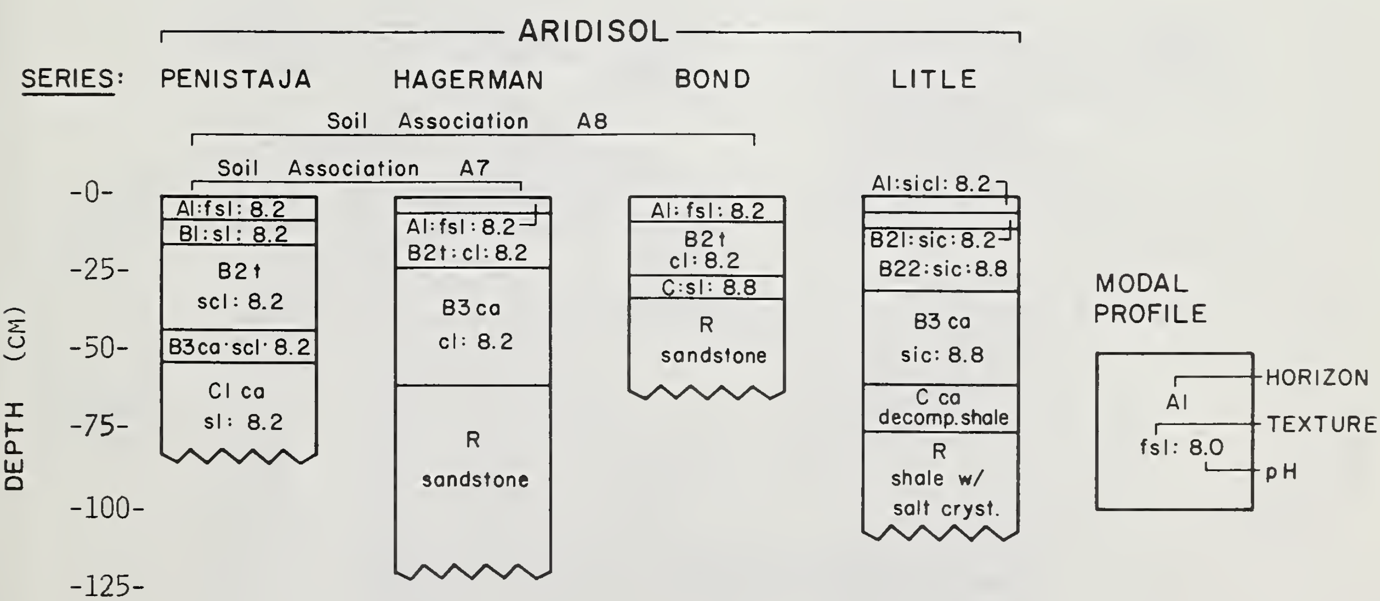


Figure A6.—Modal profiles of four soil series in the Aridisol order; includes soil associations A7 and A8.

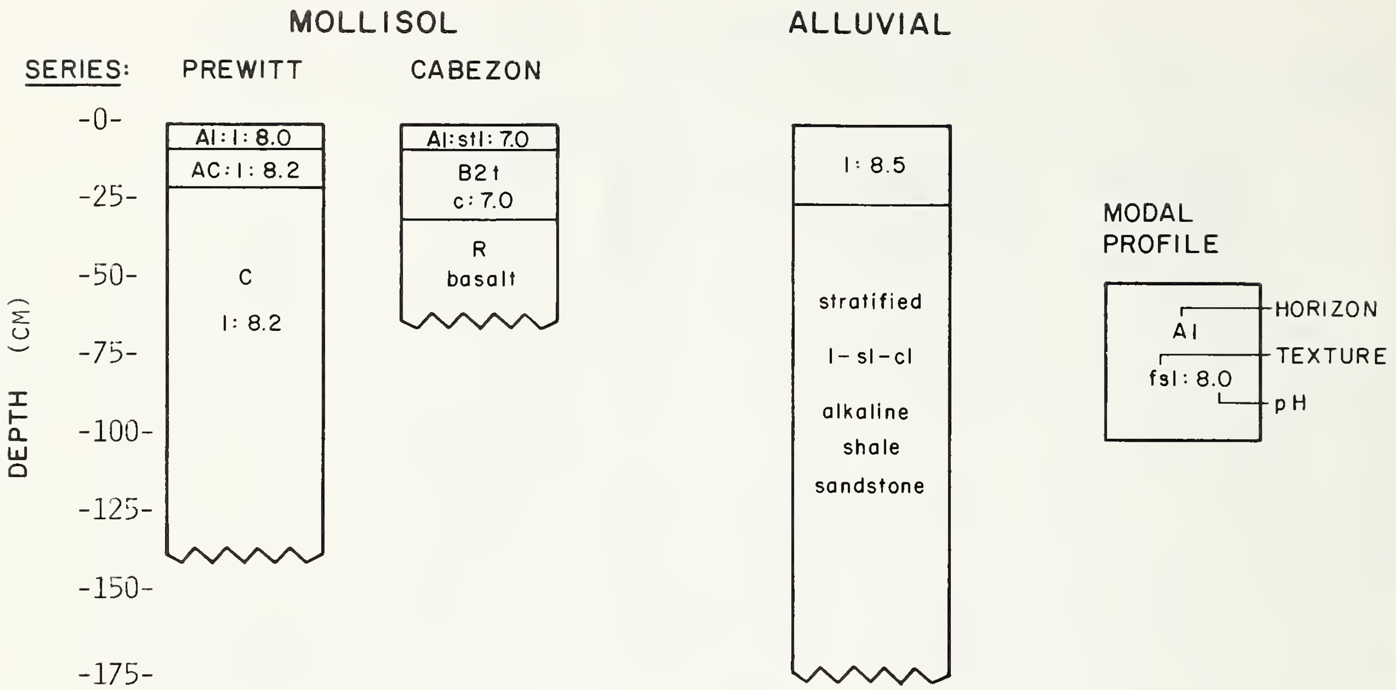


Figure A7.—Modal profiles of two soil series in the Mollisol order, and Alluvial land.

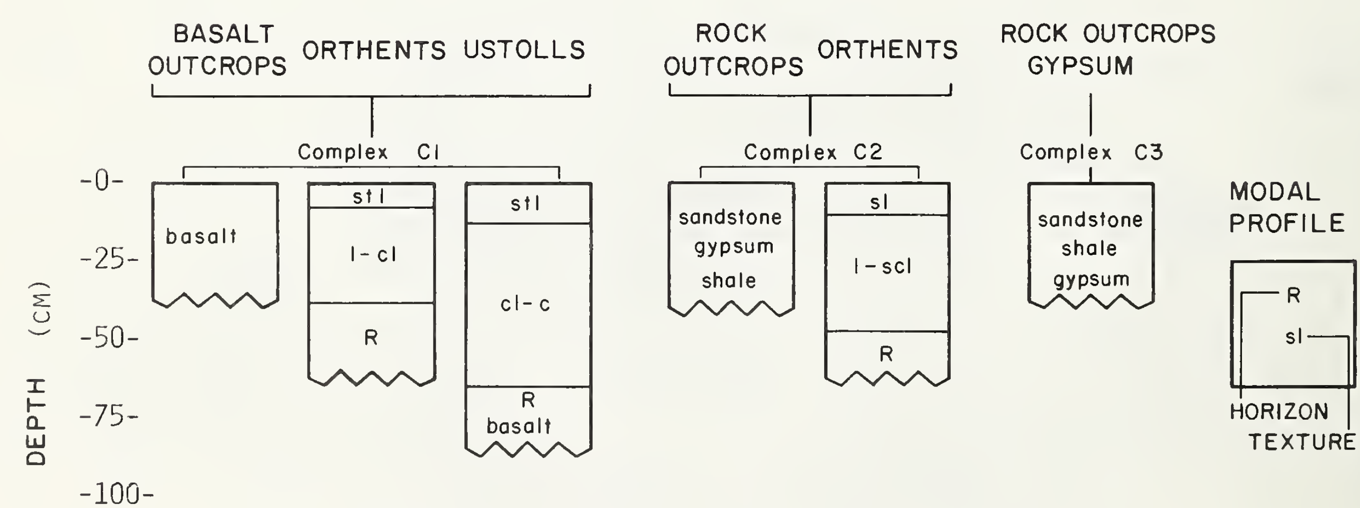


Figure A8.—Modal profiles of three soil complexes: C1, C2, C3.

APPENDIX B

Plant species of the Upper Rio Puerco Watershed. Most symbols and names follow Nickerson et al. 1976; others follow Martin and Hutchins 1980. Common names in parentheses are unofficial. Upper and lower case symbols represent the first two letters of the genus and species; upper case symbols represent the first four letters of the genus or family.

Species Symbol	Scientific Name and Authority	Common Name
Trees and shrubs		
Aloc	*Allenrolfea occidentalis* (Wats.)Kuntze	pickleweed
Arbi1	*Artemisia biennis* Willd.	biennial sagebrush
Arbi2	*Artemisia bigelovii* Gray	Bigelow sagebrush
Arca	*Artemisia cana* Pursh	silver sagebrush
Ardr2	*Artemisia dracunculoides* Pursh	false tarragon
Arfi	*Artemisia filifolia* Torr.	sand sagebrush
Arfr1	*Artemisia frigida* Willd.	fringed sagebrush
Arlu	*Artemisia ludoviciana* Nutt.	Louisiana sagebrush
Arno	*Artemisia nova* A.Nels.	black sagebrush
Artr	*Artemisia tridentata* Nutt.	big sagebrush
Atca	*Atriplex canescens* (Pursh)Nutt.	fourwing saltbush
Atco	*Atriplex confertifolia* (Torr. + Frem.)Wats.	shadscale saltbush
Atcu	*Atriplex cuneata* A.Nels	moundscale
Atob	*Atriplex obovata* Moq.	(scurfy) saltbush
Cela	*Ceratoides lanata* (Pursh)Moq.	winterfat
Cemo	*Cercocarpus montanus* Raf.	true mountainmahogany
Chde	*Chrysothamnus depressus* Nutt.	dwarf rabbitbrush
Chgr	*Chrysothamnus greenei* (Gray)Greene	Greenes rabbitbrush
Chna	*Chrysothamnus nauseosus*	rubber rabbitbrush
Chnab	ssp. *bigelovii* (Gray)H. + C.	(Bigelow) rabbitbrush
Chnag	ssp. *graveolens* (Nutt.)H. + C.	
Chnac	ssp. *consimilis* (Greene)H. + C.	
Chpa3	*Chrysothamnus parryi* (Gray)Greene	Parry rabbitbrush
Chvi3	*Chrysothamnus viscidiflorus* (Hook.)Nutt.	Douglas rabbitbrush
Epto	*Ephedra torreyana* Wats.	Torrey jointfir
Epvi	*Ephedra viridis* Cov.	green ephedra
Eula	*Eurotia lanata* (Pursh) Moq.	winterfat
Frja	*Frankenia jamesii* Torr.	Frankenia
Gusa	*Guiterrezia sarothrae* (Pursh) Britt. + Rusby = *Xanthocephalum sarothrae* Gray	broom snakeweed
Jumo	*Juniperus monosperma* (Engelm.)Sarg.	one-seed juniper
Lypa1	*Lycium pallidum* Miers	pale wolfberry
OPUN	*Opuntia* spp.	prickly pear
Opcl	*Opuntia clavata* Engelm.	club cholla
Open	*Opuntia engelmannii* Salm-Dyck	Engelmann prickly pear
Opim	*Opuntia imbricata* (Haw.)DC.	
Opph	*Opuntia phaeacantha* Engelm.	
Oppo	*Opuntia polyacantha* Haw.	plains prickly pear
Pamy	*Pachistima myrsinites* (Pursh)Raf.	myrtle pachistima
Pied	*Pinus edulis* Engelm.	pinyon pine
Pipo	*Pinus ponderosa* Laws.	ponderosa pine
Psme	*Pseudotsuga menziesii* (Mirb.)Franco	Douglas-fir
Quga	*Quercus gambelii* Nutt.	gambel oak
Qugr	*Quercus grisea* Liebm.	gray oak

Quun	*Quercus undulata* Torr.	wavyleaf (scrub) oak
Save2	*Sarcobatus vermiculatus* (Hook.)Torr.	black greasewood
TETR	*Tetradymia* spp.	horsebrush
Vasc	*Vaccinium scoparium* Leiberg	grouse whortleberry
YUCC	*Yucca* spp.	yucca species
Yuba	*Yucca baccata* Torr.	
Yuel	*Yucca elata* Engelm.	soaptree yucca
Yugl	*Yucca glauca* Nutt.	small soapweed

Forbs

Abel	*Abronia elliptica* A.Nels	pink sandverbena
Acla	*Achillea lanulosa* Nutt.	western yarrow
ACTA	*Actaea* spp.	baneberry
AGOS	*Agoseris* spp.	agoseris
Agau	*Agoseris aurantiaca* (Hook.)Greene	orange agoseris
ALLI	*Allium* spp.	onion
Alce	*Allium cernuum* Roth	nodding onion
Alte	*Allium textile* Nels. + Macbr.	textile onion
Amps	*Ambrosia psilostachya* DC.	western ragweed
ANTE	*Antennaria* spp.	pussytoes
Anro	*Antennaria rosea* (D.C. Eat.)Greene	rose pussytoes
Anro1	*Antennaria rosulata* Rydb.	pussytoes
Anse	*Androsace septentrionalis* L.	rockjasmine
ARAB	*Arabis* spp.	rockcress
Ardr1	*Arabis drummondii* Gray	Drummond rockcress
Arfe2	*Arenaria fendleri* (Wats.)Greene	Fendler sandwort
Arlas	*Arenaria lanuginosa saxosa* (Gray)Maguire (ssp.)	
Asce	*Astragalus ceramicus* Sheld.	loco
ASCL	*Asclepias* spp.	milkweed
Assu	*Asclepias subverticellata* (Gray)Vail	horsetail milkweed
ASTE	*Aster* spp.	aster
ASTR	*Astragalus* spp.	loco
Asfl2	*Astragalus flavus* Nutt.	yellow milkvetch
Asfl1	*Astragalus flexuosus* (Hook.)G.Don	flexile milkvetch
Astr1	*Astragalus gracilis* Nutt.	slender milkvetch
BORA	*Boragenaceae*	borage family
Caha	*Calylophus hartwegii* (Benth.)Raven	calyophus
Caro1	*Campanula rotundifolia* L.	bluebell
CAST	*Castillija spp.*	paintbrush
Cach	*Castilleja chromosa* A.Nels.	(colorful) paintbrush
Chvi2	*Chrysopsis villosa* (Pursh)DC.	hairy goldaster
Clse	*Cleome serrulata* Pursh	bee spiderflower
Cowr	*Cordylanthus wrightii* Gray	wright birdsbeak
CORE	*Coreopsis* spp.	coreopsis (tickseed)
Covi	*Coryphantha vivipara* (Nutt.) Britt. + Rose	pincusion cactus
Crce	*Cryptantha celosiodes* (Eastw.)Pays	desert hidden flower
Crfu	*Cryptantha fulvocanescens* (Gray)Pays	beggarlice hidden flower
CRUC	*Cruciferae*	mustard spp.
CRYP	*Cryptantha* spp.	hidden flower
CYMO	*Cymopterus* spp.	wafer-parsnip
DALE	*Dalea* spp.	dalea spp.
Deob	*Descurainia obtusa*	desert tansy mustard
Diwi	*Dithyrea wislizenii* Engelm.	spectaclepod
Ectr	*Echinocereus triglochidiatus* Engelm.	hedgehog cactus
ERIG	*Erigeron* spp.	fleabane spp.
Erco2	*Erigeron concinnus* Torr. + Gray	fleabane
Erfl1	*Erigeron flagellaris* Gray	trailing fleabane
Erfo	*Erigeron formosissimus* Greene	

ERIO1	*Eriogonum spp.*	buckwheat spp.
Erja	*Eriogonum jamesii* Benth.	James eriogonum
Erle	*Eriogonum leptophyllum* (Torr.) Woot. + Standl.	
Erlo1	*Eriogonum lonchophyllum* T + G.	spearleaf eriogonum
Ermi	*Eriogonum microthecum* Nutt.	slenderbush buckwheat
EUPH	*Euphorbia spp.*	euphorbia (spurge)
Gaco	*Gaura coccinea* (Nutt.)Pursh.	scarlet gaura
Gavi	*Gaura villosa* Torr.	
GERA	*Geranium* spp.	geranium
GILI	*Gilia spp.*	gilia
Gilo	*Gilia longiflora* (Torr.)G.Don	longflower gilia
Gimu	*Gilia multiflora* (Nutt.)V.Grant	(cluster flower) gilia
GRIN	*Grindelia* spp.	gumweed spp.
Grap	*Grindelia apanactis* Rydb.	(pinnate) gumweed
Grar	*Grindelia arizonica* Gray	Arizona gumweed
Hacu	*Haplopappus cuneatus* Gray	wedgeleaf goldenweed
Hagr	*Haplopappus gracilis* (Nutt.)Gray	
Hasp2	*Haplopappus spinulosus* (Pursh.)DC	ironplant goldenweed
Heca8	*Heterotheca canescans* Wagerknecht	telegraph plant
Hequ	*Helianthella quinquenervis* (Hook.)Gray	fivenerve helianthella
Horu	*Houstonia rubra* Cav.	bluets
HYME1	*Hymenoxys* spp.	hymenoxys
Hyac	*Hymenoxys acaulis* (Pursh.)Parker	stemless rubberweed
Hylu	*Hymenopappus lugens* Greene Jeps.	(red-bract) ragweed
Hyro	*Hymenopappus robustus* Greene	(curly) ragweed
Hyod	*Hymenoxys odorata* DC.	bitterweed hymenoxys
Hyri	*Hymenoxys richardsonii* (Hook.)Cockll.	pinque
Laar	*Larthrus arixonicus* Britt.	Arizona peavine
Lale	*Lathyrus leucanthus* Rydb.	aspen peavine
Lemo	*Lepidium montanum* Nutt.	mountain pepperweed
Lepu	*Leptodacctylon pungens* (Torr.)Rydb.	prickly phlox
LESQ	*Lesquerella spp.*	bladderpod
Lere	*Lesquerella rectipes* Woot. + Standl.	
Leer	*Leucelene ericoides* (Torr.) Greene	baby white aster
Lile	*Linum lewisii* Pursh	Lewis flax
Lipu	*Linum puberulum* (Engelm.)Heller	hairy flax
LUPI	*Lupinus* spp.	lupine
Mabi	*Machaeranthera begelovii* (Gray)Greene	Bigelow aster
Maca1	*Machaeranthera canescens* (Pursh)Gray	hoary aster
Mela	*Mertensia lanceolata* (Pursh)A.DC.	lanceleaf bluebells
Meof	*Melilotus officinalis* (L.)Lam.	yellow sweet clover
MENT1	*Mentzelia* spp.	mentzelia (stickleaf)
Mepu	*Mentzelia pumila* (Nutt.)T. + G.	golden blazing star
Mesa	*Medicago sativa* L.	alfalfa
MIRA	*Mirabilis* spp.	four-o'clock
Mili	*Mirabilis linearis* (Pursh)Heimerl	four-o'clock
Mimu	*Mirabilis multiflora* (Torr.)Gray	wild four-o'clock
Mope2	*Monarda pectinata* Nutt.	pony beebalm
Oeco	*Oenothera coronopifolia* T. + G.	evening primrose
OROB	Orobanche spp.	broomrape
Ormu	*Orbanche multiflora* Nutt.	cancerroot
Peca	*Petalostemon candidum* Michx.	white prairie clover
PENS	*Penstemon spp.*	penstemon
Phlo	*Phlox longifolia* Nutt.	longleaf phlox
PHYS	*Physalis spp.*	ground cherry
Phvi	*Physalis virginiana* mill.	Pecos groundcherry
Poal	*Polygala alba* Nutt.	white polygala
Pogr2	*Potentilla gracilia* Hook.	northwest cinquefoil
Pohi	*Potentilla hippiana* Lehm.	horse cinquefoil
Popu	*Potentilla pulcherrima* Lehm.	beauty cinquefoil

Psta	*Psilostrophe tagetina* (Nutt.)Greene	woolly paperflower
Pste	*Psoralea tenuiflora* Pursh	slimflower scurfpea
Saka	*Salsola kali* L.	Russian thistle
Sami	*Sanguisorba minor* Scop.	burnet
SENE	*Senecio* spp.	groundsel
Selo	*Senecio longilobus* Benth.	threadleaf groundsel
Semu1	*Senecio multicapitatus* Greene	(multi-flowered) groundsel
Semu	*Senecio multilobatus* T.+G.	(pinnate) groundsel
Sene1	*Senecio neonmexicanus* Gray	New Mexico groundsel
Sisc	*Silene scouleri* Hook.	scouler silene
SOLA	*Solanum* spp.	nightshade
Soel	*Solanum eleagnifolium* Cav.	silverleaf nightshade
Sofe	*Solanum fendleri* Gray	fendler potato
Sose2	*Sophora sericea* Nutt.	silky sophora
SPHA	*Sphaeralcea* spp.	globemallow
Spco1	*Sphaeralcea coccinea* (Purhs)Rydb.	scarlet globemallow
Spdi	*Sphaeralcea digitata* (Greene)Rydb.	(two-cleft) globemallow
Spin	*Sphaeralcea incana* Torr.	(yellow) globemallow
STEP	*Stephanomeria* spp.	wirelettuce
SUAE	*Suaeda* spp.	seep weed
Tala2	*Taraxacum laevigatum* (Willd.)DC.	red-seeded dandelion
Tapa1	*Talinum parviflorum* Nutt.	prairie fameflower
Thal	*Thlaspi alpestre* L.	white candy tuft
Thme	*Thelesperma megapotamicum* (Spreng.)Kuntze	green thread
Thpi	*Thermopsis pinetorum* Greene	pine thermopsis
Toin	*Townsendia incana* Nutt.	hoary townsendia
TRAD	*Tradescantia* spp.	spiderwort
TRAG1	*Tragapogon* spp.	salsify
Troc	*Tradescantia occidentalis* (Britt.)Smyth	prairie spiderwort
TRIF	*Trifolium* spp.	clover
Vebi	*Verbena bipinnatifida* Nutt.	Dakota verbena
Vebr	*Verbena bracteata* Lag.+Rodr.	bigbract verbena
Viam	*Vicia americana* Muhl.	American vetch
Viex	*Vicia exigua* Nutt.	slim vetch
VIGU	*Viguiera* spp.	golden eye
VIOL	*Viola* spp.	violet
Ziel	*Zigadenus elegans* Pursh	mountain deathcamas
Zigr	*Zinnia grandiflora* Nutt.	Rocky Mountain zinnia

Grasses and Grasslikes

Agcr	*Agropyron cristatum* (L.) Gaertn.	crested wheatgrass
Agda	*Agropyron dasytachyum* (Hook.)Scribr.	thickspike wheatgrass
Agde1	*Agropyron desertorum* (Fisch.)Schult.	desert wheatgrass
Agin	*Agropyron intermedium* (Host)Beauv.	intermediate wheatgrass
Agsm	*Agropyron smithii* Rydb.	bluestem wheatgrass
Agsu	*Agropyron subsecundum* (Link)Hitchc.	bearded wheatgrass
Agtr1	*Agropyron trachycaulum* (Link)Malte	slender wheatgrass
Agtr2	*Agropyron trichophorum* (Link)Richt.	pubescent wheatgrass
Anha	*Andropogon hallii* Hack.	sand bluestem
Ansc	*Andropogon scoparius* Michx.	little bluestem
Arfe1	*Aristida fendleriana* Steud.	Fendler threeawn
Arlo1	*Aristida longiseta* Steud.	red threeawn
Bltr	*Blepharoneuron tricholepis* (Torr.)Nash	pine dropseed
Boba	*Bouteloua barbata* Lag.	six weeks grama
Bocu	*Bouteloua curtipendula* (Michx.)Torr.	sideoats grama
Boer	*Bouteloua eriopoda* (Torr.)Torr.	black grama
Bogr	*Bouteloua gracilis* (H.B.K.)Steud.	blue grama
Bohi	*Bouteloua hirsuta* Log.	hairy grama
Brin1	*Bromus inermis* Leyss.	smooth brome

Brte	*Bromus tectorum* L.	cheatgrass brome
Buda	*Buchloe dactyloides* (Nutt.)Engelm.	buffalo grass
CARE	*Carex* spp.	sedge
Cafo	*Carex foenea* Willd.	silvertop sedge
CYPE	*Cyperus* spp.	flatsedge
Cysc	*Cyperus schweinitzii* Torr.	Schweinitz flatsedge
Dist	*Distichlis stricta* (Torr.)Rydb.	inland saltgrass
ERAG	*Eragrostis* spp.	lovegrass
Fear	*Festuca arizonica* Vasey	Arizona fescue
Feth	*Festuca thurberi* Vasey	Thurber fescue
Hija	*Hilaria jamesii* (Torr.)Benth.	galleta
Kocr	*Koeleria cristata* Pers.	prairie junegrass
MUHL	*Muhlenbergia* spp.	muhly
Muar1	*Muhlenbergia arenicola* Buckl.	sand muhly
Mufi1	*Muhlenbergia filiculmis* Vasey	slimstem muhly
Mumo	*Muhlenbergia montana* Nutt.Hitchc.	mountain muhly
Mure	*Muhlenbergia repens* (Presl)Hitchc.	red muhly
Mupo	*Muhlenbergia porteria* Scribn.	bush muhly
Muri1	*Muhlenbergia richardsonis* (Trin.) Rydb.	mat muhly
Mupu	*Muhlenbergia pungens* Thurb.	sandhill muhly
Muto	*Muhlenbergia torreyi* (Kunth)Bush	ring muhly
Muwr	*Muhlenbergia wrightii* Vasey	spike muhly
Musq	*Munroa squarrosa* (Nutt.)Torr.	false buffalograss
Orhy	*Oryzopsis hymenoides* (R.+S.) Richer	Indian ricegrass
Paob	*Panicum obtusum* H.B.K.	vine mesquite
POA	*Poa* spp.	bluegrass
Pofe	*Poa fendleriana* (Steud.)Vasey	mutton bluegrass
Popa	*Poa palustris* L.	fowl bluegrass
Pose	*Poa secunda* Presl. = P. sandbergii Vasey	Sandberg bluegrass
Scbr	*Scleropogon brevifolius* Phil.	burrograss
Sihy	*Sitanion hystrix* (Nutt.) J.G.Sm.	bottlebrush squirreltail
SPOR	*Sporobolus* spp.	dropseed
Spai	*Sporobolus airoides* (Torr.)Torr.	alkali sacaton
Spas	*Sporobolus asper* (Michx.)Kunth	tall dropseed
Spco	*Sporobolus contractus* Hitchc.	spike dropseed
Spcr	*Sporobolus cryptandrus* (Torr.)Gray	sand dropseed
Spfl	*Sporobolus flexuosus* (Thrub.)Rydb.	mesa dropseed
Spgi	*Sporobolus gigantea* Nash	giant dropseed
Spne1	*Sporobolus nealleyi* Vasey	gypgrass
STIP	*Stipa* spp.	needlegrass
Stco1	*Stipa comata* Trin.+Rupr.	needle and thread
Stle	*Stipa lettermanii* Vasey	letterman needlegrass
Stne	*Stipa neomexicana* (Thrub.)Scribr.	New Mexico featherglass
Stro	*Stripa robusta* (Vasey)Scribn.	sleepy grass

APPENDIX C

Key to the plant communities (p.c.) of the
Upper Rio Puerco Watershed, New Mexico

1a. Plant community with a tree synusia (layer) dominant or conspicuous consisting of Pipo (*Pinus ponderosa*), Pied (*Pinus edulis*), and/or Jumo (*Juniperus monosperma*) ... 2

1b. Plant community without a tree synusia; dominated by shrubs and/or grasses ... 9

2a. Pipo dominant, co-dominant, or conspicuous ... 3

2b. Pipo not dominant or conspicuous ... 4

3a. Pipo synusia with CARE (*Carex* spp.) and/or Bogr (*Bouteloua gracilis*) as the dominant understory synusia; occurring on mesas or colluvial slopes; soils shallow, loamy
...*Pinus ponderosa/Carex* spp.-*Bouteloua gracilis* p.c.1
(Pipo/CARE-Bogr; ponderosa pine/sedge-blue grama)

3b. Pipo dominant with Pied co-dominant or conspicuous; Bogr and CARE as the dominant understory synusia; occurring on mesas; soils shallow, loamy
...*Pinus ponderosa - P. edulis/Bouteloua gracilis – Carex* spp. p.c.2
(Pipo-Pied/Bogr-CARE; ponderosa pine-pinyon pine/ blue grama-sedge)

4a. Pied dominant or conspicuous ... 5

4b. Jumo dominant or conspicuous ... 7

5a. Pied dominant or conspicuous with Bogr and/or ERIO (*Eriogonum* spp.) dominating the understory synusia; occurring on steep, rocky colluvial slopes; soils shallow, sandy-clay loam
...*Pinus edulis/Bouteloua gracilis-Eriogonum* spp. p.c.3
(Pied/Bogr-ERIO; pinyon pine/blue grama-buckwheat)

5b. Pied co-dominant with Jumo or Quga (*Quercus gambelii*) ... 6

6a. Pied co-dominant with Jumo; Oppo (*Opuntia polyacantha*) and/or Bogr dominant or conspicuous understory synusia components; occurring on mesas; soils shallow, stoney-clay loam or basalt outcrops
...*Pinus edulis-Juniperus monosperma/Opuntia polyacantha/Bouteloua gracilis* p.c.4
(Pied-Jumo/0ppo/Bogr; pinyon pine-one-seed juniper/ pricklypear cactus/blue grama)

6b. Pied co-dominant with Quga; Hija (*Hilaria jamesii*) and/or Spne (*Sporobolus nealleyi*) as dominant or conspicuous understory synusia components; occurring on mesas; soils gypsum-sandstone-shale outcrops
...*Pinus edulis/Quercus gambelii/Hilaria jamesii-Sporobolus neallyii* p.c.5
(Pied/Quga/Hija-Spne; pinyon pine/gambel oak/ galleta-gypgrass)

7a. Jumo dominant or conspicuous w/o a shrub synusia; Bogr dominating the understory synusia; occurring on breaks or colluvial slopes; soils shallow, loamy sand-clay ...*Juniperus monosperma/Bouteloua gracilis* p.c.7
(Jumo/Bogr; one-seed juniper/blue grama)

7b. Jumo dominant or conspicuous; Gusa (*Gutierrezia sarothrae*) or Artr (*Artemisia tridentata*) as a shrub synusia ... 8

8a. Jumo dominant or conspicuous with Gusa as the major shrub component; Bogr and/or Hija dominating the understory synusia; occurring on breaks or colluvial slopes; soils shallow, silty-clay loam ...*Juniperus monosperma/Gutierrizia sarothrae/ Bouteloua gracilis-Hilaria jamesii* p.c.6
(Jumo/Gusa/Bogr-Hija; one-seed juniper/snakeweed/ blue grama-galleta)

8b. Jumo dominant or conspicuous with Artr as the major shrub component; Hija and/or Spcr (*Sporobolus cryptandrus*) dominating the understory synusia; occurring on mesas; soils shallow, fine-loamy ...*Juniperus monosperma/Artemisia tridentata/ Hilaria jamesii-Sporobolus cryptandrus* p.c.8
(Jumo/Artr/Hija-Spcr; one-seed juniper/big sagebrush/galleta-sand dropseed)

9a. Plant community dominated by or with a conspicuous shrub synusia ... 10

9b. Plant community w/out a conspicuous shrub synusia; dominated by graminoids; Gusa may be a dominant component ... 32

10a. *Artemisia* dominant, co-dominant, or conspicuous ... 11

10b. *Artemisia* not conspicuous ... 19

11a. Artr dominant, co-dominant, or conspicuous ... 12

11b. Arno (*Artemisia nova*) dominant, co-dominant, or conspicuous ... 18

12a. Artr dominant ... 13

12b. Artr co-dominant ... 15

13a. Artr dominant or conspicuous; Spcr and/or Orhy (*Oryzopsis hymenoides*) dominating the understory synusia; occurring on alluvial flats; soils shallow, loamy ...*Artemisia tridentata/Sporobolus cryptandrus-Oryzopsis hymenoides* p.c.14
(Artr/Spcr-Orhy; big sagebrush/sand dropseed-Indian rice-grass)

13b. Artr dominant or conspicuous; Bogr dominant or co-dominant in the understory synusia ... 14

14a. Artr dominating the shrub synusia; Bogr and/or Hija co-dominating the understory synusia; occurring on mesas or alluvial flats; soils deep, sandy to fine-loam

...*Artemisia tridentata/Bouteloua gracilis-Hilaria jamesii* p.c.9
(Artr/Bogr-Hija; big sagebrush/blue grama-galleta)

14b. Artr dominating the shrub synusia; Bogr, Hija, and/or Spai (*Sporobolus airoides*) co-dominating the understory synusia; occurring on alluvial flats; soils deep, fine to course loam
...*Artemisia tridentata/Bouteloua gracilis-Hilaria jamesii-Sporobolus airoides* p.c.11
(Artr/Bogr-Hija-Spai; big sagebrush/blue grama-galleta-alkali sacaton)

15a. Artr co-dominant with Chpa (*Chrysothamnus parryi*); Arfe (*Aristida fendleriana*) and/or Bogr co-dominating the understory synusia; occurring on alluvial flats; soil deep, clayey
...*Artemisia tridentata-Chrysothamnus parryi/Aristada fendleriana-Bouteloua gracilis* p.c.15
(Artr-Chpa/Arfe-Bogr; big sagebrush-Parry rabbitbrush/Fendler threeawn-blue grama)

15b. Artr co-dominant with Gusa ... 16

16a. Artr and Gusa co-dominant, or Gusa conspicuous; Hija and Spai dominant understory components; Bogr minor; occurring on colluvial or alluvial slopes; soils deep, fine-loamy
...*Artemisia tridentata-Gutierrezia sarothrae/Hilaria jamesii-Sporobolus airoides* p.c.12
(Artr-Gusa/Hija-Spai; big sagebrush-snakeweed/galleta-alkali sacaton)

16b. Artr and Gusa co-dominant, or Gusa conspicuous; Bogr dominating the understory synusia 17

17a. Bogr dominant or co-dominant with Hija; occurring on mesas or alluvial flats; soils deep, fine-loam
...*Artemisia tridentata-Gutierrezia sarothrae/Bouteloua gracilis-Hilaria jamesii* p.c.10
(Artr-Gusa/Bogr-Hija; big sagebrush-snakeweed/blue grama-galleta)

17b. Bogr dominant or co-dominant with Agsm (*Agropyron smithii*) occurring on alluvial flats; soils deep, fine-loamy
...*Artemisia tridentata-Gutierrezia sarothrae/Bouteloua gracilis-Agropyron smithii* p.c.13
(Artr-Gusa/Bogr-Agsm; big sagebrush-snakeweed/blue grama-western wheatgrass)

18a. Arno and Artr co-dominant; Agcr (*Agropyron cristatum*) and/or Agsm co-dominanting the understory synusia; occurring on alluvial flats; soils deep, clay to clay-loam
...*Artemisia nova-A. tridentata/Agropyron cristatum-Agropyron smithii* p.c.16
(Arno-Artr/Agcr-Agsm; black sagebrush-big sagebrush/crested wheatgrass-western wheatgrass)

18b. Arno and Gusa co-dominant or Gusa conspicuous; Bogr and/or Hija dominating the understory synusia; occurring on breaks; soils shallow, sandy-loam or clayey
...*Artemisia nova-Gutierrezia sarothrae/ Bouteloua gracilis-Hilaria jamesii* p.c.17
(Arno-Gusa/Bogr-Hija; black sagebrush-snakeweed/blue grama-galleta)

19a. *Chrysothamnus* dominant or conspicuous ... 20
19b. *Chrysothamnus* not dominant ... 22

20a. Chpa dominant or conspicuous; Hija and/or Bogr dominant in the understory synusia; occurring on alluvial flats; soils deep, sandy to loamy
...*Chrysothamnus parryi/Hilaria jamesii-Bouteloua gracilis* p.c.19
(Chpa/Hija-Bogr; Parry rabbitbrush/galleta-blue grama)

20b. Chna (*Chrysothamnus nauseosus*) dominant or conspicuous; Bogr and/or Agsm dominating the understory synusia ... 21

21a. Chnab dominant; occurring on alluvial flats; soils moderately deep, silty loam
...*Chrysothamnus nauseosus bigelovii/ Bouteloua gracilis-Agropyron smithii* p.c.18
(Chnab/Bogr-Agsm; Bigelow rubber rabbit-brush/blue grama-western wheatgrass)

21b. Chnag dominant; occurring on alluvial flats; soils deep, fine-silty-clay loam
...*Chrysothamnus nauseosus graveolens/Bouteloua gracilis-Agropyron smithii* p.c.20
(Chnag/Bogr-Agsm; green plume rubber rabbit-brush/blue grama-western wheatgrass)

22a. Save (*Sarcobatus vermiculatus*) dominant or conspicuous ... 23

22b. Save not dominant ... 24

23a. Save dominant as a monospecific community; occurring on alluvial flats; soils deep, clayey
...*Sarcobatus vermiculatus* p.c.21
(Save; black greasewood)

23b. Save dominant; Sihy (*Sitanion hystrix*) and/or Agsm dominating the understory synusia; occurring on alluvial flats; soils deep, clayey
...*Sarcobatus vermiculatus/Sitanion hystrix-Agropyron smithii* p.c.22
(Save/Sihy-Agsm; black greasewood/bottlebrush squirreltail-western wheatgrass)

24a. *Ceratoides* dominant, Gusa co-dominant or conspicuous ... 25

24b. *Ceratoides* not dominant ... 26

25a. Hija dominating the understory synusia; occurring on alluvial flats; soils moderately deep, loamy

. . . *Ceratoides lanata-Gutierrezia sarothrae/Hilaria jamesii* p.c.23
(Cela-Gusa/Hija; winterfat-snakeweed/galleta)

25b. Bogr dominating the understory synusia; occurring on alluvial flats and mesas; soils moderately deep, silty-clay loam
. . . *Ceratoides lanata-Gutierrezia sarothrae/Bouteloua gracilis* p.c.24
(Cela-Gusa/Bogr; winterfat-snakeweed/blue grama)

26a. *Atriplex* dominant or conspicuous . . . 27

26b. *Atriplex* not dominant . . . 32

27a. Atcu (*Atriplex cuneata*) and Frja (*Frankenia jamesii*) dominant, co-dominant, or conspicuous; Spai dominant grass component; occurring on colluvial slopes; soils shallow, sandy to silty clay loam
. . . *Atriplex cuneata-Frankenia jamesii/Sporobolus airoides* p.c.25
(Atcu-Frja/Spai; moundscale-Frankenia/alkali sacaton)

27b. Atob (*Atriplex obovata*) or Atca (*Atriplex canescens*) dominant or conspicuous . . . 28

28a. Atob and/or Gusa dominant . . . 29

28b. Atca and/or Gusa dominant . . . 30

29a. Atob dominant or conspicuous; Spai and/or Spcr (*Sporobolus cryptandrus*) dominating the grass component; occurring on alluvial flats; soils deep, clay-loam
. . . *Atriplex obovata/Sporobolus airoides-Sporobolus cryptandrus*
(Atob/Spai-Spcr; broadscale/alkali sacaton-sand dropseed) p.c.26

29b. Atob and Gusa co-dominant or conspicuous; Hija and/or Spai dominating the grass component; occurring on alluvial flats; soils shallow, sandy-loam to clay loam
. . . *Atriplex obovata – Gutierrezia sarothrae/Hilaria jamesii-Sporobolus airoides* p.c.27
(Atob-Gusa/Hija-Spai; broadscale-snakeweed/galleta-alkali sacaton)

30a. Atca and Gusa co-dominant or conspicuous; Bogr and/or Spcr dominant grasses; occurring on alluvial flats; soil deep, loamy-sand to clay
. . . *Atriplex canescens-Gutierrezia sarothrae/Bouteloua gracilis-Sporobolus cryptandrus* p.c.30
(Atca-Gusa/Bogr-Spcr; fourwing saltbush-snakeweed/blue grama-sand dropseed)

30b. Atca dominant or conspicuous . . . 31

31a. Hija the dominant grass; occurring on alluvial flats; soils deep, silty-

sandy clay loam
...*Atriplex canescens/Hilaria jamesii* p.c.28
(Atca/Hija; fourwing saltbush/galleta)

31b. Spai and/or Sihy the dominant grass(es); occurring on alluvial flats; soils deep, loamy
...*Atriplex canescens/Sporobolus airoides-Sitanion hystrix* p.c.29
(Atca/Spai-Sihy; fourwing saltbush/alkali sacaton-bottlebrush squirreltail)

32a. *Bouteloua* and/or Gusa dominant, co-dominant, or conspicuous... 33

32b. *Bouteloua* not dominant ... 37

33a. Boer (*Bouteloua eriopoda*) and/or Gusa dominant, co-dominant, or conspicuous; Hija a major component; occurring on mesas; soils shallow to moderately deep, loamy to clay-loam
...*Gutierrezia sarothrae/Bouteloua eriopoda-Hilaria jamesii* p.c.35
(Gusa/Boer-Hija; snakeweed/black grama-galleta)

33b. Bogr and/or Gusa dominant, co-dominant, or conspicuous ... 34

34a. Bogr dominant; Gusa a very minor component ... 35

34b. Bogr and/or Gusa dominant, co-dominant, or conspicuous ... 36

35a. Hija co-dominant or conspicuous; occurring on alluvial flats; soils deep, silty-clay-loam
...*Bouteloua gracilis-Hilaria jamesii* p.c.31
(Bogr-Hija; blue grama-galleta)

35b. Spai co-dominant or conspicuous; occurring on mesas; soils moderately deep, clay
...*Bouteloua gracilis-Sporobolus airoides* p.c.34
(Bogr-Spai; blue grama-alkali sacaton)

36a. Bogr and/or Gusa dominant, co-dominant, or conspicuous; Hija a major component; occurring on mesas and alluvial flats; soils moderately deep, loamy
...*Gutierrezia sarothrae/Bouteloua gracilis-Hilaria jamesii* p.c.32
(Gusa/Bogr-Hija; snakeweed/blue grama-galleta)

36b. Bogr and/or Gusa dominant, co-dominant, or conspicuous; Boer a major component; occurring on colluvial slopes; soils shallow, stoney-clay-loam
...*Gutierrezia sarothrae/Bouteloua gracilis-B. eriopoda* p.c.33
(Gusa/Bogr-Boer; snakeweed/blue grama-black grama)

37a. Hija and/or Gusa dominant, co-dominant, or conspicuous ... 38

37b. Hija not dominant ... 40

38a. Hija and/or Spai dominant, co-dominant, or conspicuous; Gusa a minor component; occurring on alluvial flats; soils moderately deep, fine-loam
...*Hilaria jamesii-Sporobolus airoides* p.c.37
(Hija-Spai; galleta-alkali sacaton)

38b. Hija and/or Gusa dominant, co-dominant, or conspicuous ... 39

39a. Bogr a major component occurring on colluvial slopes or alluvial flats; soils shallow to moderately deep, fine loam to fine silt
...*Gutierrezia sarothrae/Hilaria jamesii Bouteloua gracilis* p.c.36
(Gusa/Hija-Bogr; snakeweed/galleta-blue grama)

39b. Spcr (*Sporobolus cryptandrus*) a major component; occurring on alluvial flats; soils moderately deep, silty-clay-loam
...*Gutierrezia sarothrae/Bouteloua gracilis-Sporobolus cryptandrus* p.c.38
(Gusa/Bogr-Spcr; snakeweed/blue grama-sand dropseed)

40a. *Scleropogon* dominant or co-dominant; occurring on alluvial flats; soils deep, clay-loam
...*Sclerpogon brevifolius-Bouteloua gracilis* p.c.45
(Scbr-Bogr; burrograss-blue grama)

40b. *Sporobolus* and/or Gusa dominant, co-dominant, or conspicuous ... 41

41a. Spne and/or Boer dominant, co-dominant, or conspicuous; occurring on mesas; soils shallow, gypsum
...*Sporobolus nealleyi-Bouteloua eriopoda* p.c.44
(Spne/Boer; gypgrass-black grama)

41b. Spai and/or Gusa dominant, co-dominant or conspicuous... 42

42a. Spai and/or Gusa dominant, co-dominant, or conspicuous; Hija a major component; occurring on alluvial flats; soils moderately deep, sandy/silty-clay-loam
...*Gutierrezia sarothrae/Sporobolus airoides-Hilaria jamesii* p.c.42
(Gusa/Spai-Hija; snakeweed/alkali sacaton-galleta)

42b. Spai dominant or co-dominant; Gusa a very minor component, if at all ... 43

43a. Spai dominating essentially monospecific communities on alluvial flats
...*Sporobolus airoides* p.c.39
(Spai; alkali sacaton)

43b. Spai dominant or co-dominant with Bogr, Hija, or Agsm; occurring on alluvial flats; soils deep, silty-clay-loam
...*Sporobolus airoides-Bouteloua gracilis* p.c.40
(Spai-Bogr; alkali sacaton-blue grama)

...*S. airoides-Hilaria jamesii* p.c.41
(Spai-Hija; alkali sacaton-galleta)

...*S. airoides-Agropyron smithii* p.c.43
(Spai-Agsm; alkali sacaton-wheatgrass)

APPENDIX D

Terminology

Amplitude, Ecological: Plant species range of external physical [and biological] environmental conditions [necessary] for growth (Shimwell 1972).

Climax: A stable, perpetuating plant community in equilibrium with its environment (Daubernmire 1968). Pristine vegetation is not implied.

Community-type (c.t.): An abstract concept based upon the knowledge of the nature of several similar community stands (Shimwell 1972). Community-type is analogous to the association in a hierarchy, but successional stage is not implied; ie: c.t. may or may not be stable (climax).

Degraded Site: A homogenous area which has been reduced in ecological potential through erosion and/or severe overuse.

Diversity, Ecological: The number of species (species richness) in relation to their [spatial] distribution (concept of evenness, Margalef 1958) (Pielou 1974). Beta = between-habitat diversity; alpha = within-habitat diversity (Whittaker 1975).

Dominance: The degree of [structural and/or functional] influence exerted over other species within a community (Greig-Smith 1983).

Effective soil: Zone of maximum organic matter accumulation and nutrient content for plant growth; usually the A- and B-horizons.

Formation: A hierarchical vegetation class determined by its dominant physiognomic life-form; i.e., treeland, shrubland, grassland (UNESCO 1973, Brown et al. 1979).

Grassland: An area on which the vegetation is dominated by herbaceous plants (Powell 1982).

Niche, Ecological: The totality of sets of conditions that are compatible with a species persistence and success (Pielou 1974) including both structural and functional relationships.

Plant Community (p.c.): An organized complex with a typical floristic composition and morphological structure which have resulted from the interaction of species populations [edaphic, and climatic factors] through time (Shimwell 1972).

Phyto-Edaphic Community:An abstract ecological unit based on concrete plant (phyto) and soil (edaphic) characteristics analogous to habitat type (Daubenmire 1968) but without implied successional status.

Potential Natural Vegetation: Hypothetical, stable plant community based on existing vegetation projected into some undefined future accounting for current site conditions and minimum human disturbance (Mueller-Dombois and Ellenberg 1974, Schlatterer 1978).

Series: A hierarchical vegetation class determined by its dominant species regardless of life-form (Mueggler and Stewart 1980, Brown et al. 1982, Driscoll et al. 1984); stability is implied. In the context of this paper, stability is not implied and perhaps the term subseries should be used as a seral equivalent.

Shrubland: An area on which the vegetation is dominated by shrubs (Powell 1982).

Site: A homogenous, concrete landscape unit used as a sample area for vegetation and soil.

Stand: A concrete example of a community located in the field used for study (Shimwell 1972).

Subformation: A hierarchical vegetation class determined by its dominant genus (Adapted from DuRietz 1930).

Treeland: An area on which the vegetation is dominated by trees (Powell 1982). Treeland is used in this paper as an ecological lifeform equivalent to grassland and shrubland rather than the traditional use of the term forest.

Francis, Richard E. 1986. Phyto-edaphic communities of the Upper Rio Puerco Watershed, New Mexico. USDA Forest Service Research Paper RM–272, 73 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

The Upper Rio Puerco Watershed in northwestern New Mexico was classified into 45 ecological phyto-edaphic communities using cluster analysis based on species importance values. The community descriptions consist of vegetation and soil surface characteristics; landform; soil series, association, or complex; ecological stage; and potential natural vegetation. The communities represented 11 vegetation series consisting of 2-treeland, 5-shrubland, and 4-grassland formations. Three soil orders, 27 soil series, nine associations, and three soil complexes were identified. The combination of landform, vegetation, and soil were considered phyto-edaphic communities; a dichotomous key was developed for field identification.

Keywords: Phyto-edaphic communities, community classification, cluster analysis, importance values, Rio Puerco, New Mexico.

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Rocky
Mountains

Southwest

Great
Plains

U.S. Department of Agriculture
Forest Service

Rocky Mountain Forest and Range Experiment Station

The Rocky Mountain Station is one of eight regional experiment stations, plus the Forest Products Laboratory and the Washington Office Staff, that make up the Forest Service research organization.

RESEARCH FOCUS

Research programs at the Rocky Mountain Station are coordinated with area universities and with other institutions. Many studies are conducted on a cooperative basis to accelerate solutions to problems involving range, water, wildlife and fish habitat, human and community development, timber, recreation, protection, and multiresource evaluation.

RESEARCH LOCATIONS

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Flagstaff, Arizona
Fort Collins, Colorado*
Laramie, Wyoming
Lincoln, Nebraska
Rapid City, South Dakota
Tempe, Arizona

*Station Headquarters: 240 W. Prospect St., Fort Collins, CO 80526